

**KOOTENAY NATIONAL PARK
WILDERNESS RECREATION PROGRAM
1986 REVIEW**

**Prepared by: George Sranko
Wilderness Recreation Specialist
Visitor Services
Kootenay National Park**

October, 1986

Wilderness Recreation Program - Review 1986

Table of Contents:

1.0	<u>Introduction</u>	1
2.0	<u>Planning</u>	1
2.1	<u>Kootenay National Park Trail Plan</u>	1
2.2	<u>Backcountry Management Plan</u>	2
2.3	<u>Multi-year Operational Plan</u>	2
3.0	<u>Capital Program</u>	3
3.1	<u>Floe Lake Campground Reconstruction and Rehabilitation</u>	3
3.1.1	<u>Work Accomplished</u>	4
3.1.2	<u>Project Review</u>	4
3.1.3	<u>Project Follow-up</u>	5
3.2	<u>Rockwall Pass Trail Project</u>	5
3.2.1	<u>Work Accomplished</u>	6
3.2.2	<u>Project Review</u>	7
3.2.3	<u>Project Follow-up</u>	8
3.3	<u>Capital Cost Analysis</u>	9
3.3.1	<u>Introduction:</u>	9
3.3.2	<u>Unit Price Schedules:</u>	9
3.3.3	<u>Cost Comparison</u>	11
3.3.4	<u>Detailed Cost Analysis: Capital Projects</u>	12
3.3.5	<u>Capital Program Considerations</u>	14
3.3.6	<u>Project Cost Estimates</u>	14
3.3.7	<u>Capital Labour Costs</u>	17
3.4	<u>Backcountry Food Storage Installation</u>	20
3.5	<u>Backcountry Sign Installation</u>	20
3.6	<u>Capital Program Summary</u>	21
3.6.1	<u>Capital Person Years</u>	21
3.6.2	<u>Backcountry Camps: Contract Crews</u>	22
3.6.3	<u>Contract Review Meeting - September 18, 1986</u>	23
3.7	<u>Capital Program Recommendations: Contracts</u>	23
4.0	<u>Operations and Maintenance Program</u>	25
4.1	<u>Organization</u>	25
4.2	<u>Standards</u>	26
4.3	<u>O&M Budget</u>	27
4.4	<u>Training</u>	28
4.5	<u>O&M Program Review</u>	29
5.0	<u>Statistics</u>	29
6.0	<u>Volunteer Program</u>	30
7.0	<u>Wilderness Recreation Program Recommendations</u>	32

APPENDIX 1

1986 YEAR-END TRAIL REPORT 35

APPENDIX 2

BACKCOUNTRY REHABILITATION PROJECT 53

APPENDIX 3

MONITORING TRAIL USAGE 60

APPENDIX 4

PHOTOGRAPHS 62

WILDERNESS RECREATION PROGRAM REVIEW -
OCTOBER, 1986

1.0 Introduction

This program, after more than two years of intensive planning, forecasting and organizing, was put into high gear in 1986. The management of backcountry facilities in Kootenay National Park was placed under one cohesive organization for the first time in many years. In February 1986 the Superintendent, D.L. Pick, approved the formation of a unit responsible for the management of all backcountry facilities reporting to the Wilderness Recreation Specialist within Visitor Services. This unit included all staff, including the Trail Co-ordinator and trail crew, involved in the planning, coordinating and controlling of work on backcountry facilities. This document is a review of the operation and effectiveness of that re-organization and resulting Wilderness Recreation Program.

For further details on capital projects, operations and maintenance, refer to the Appendix 1 1986 Year-End Trails Report prepared by the Trail Co-ordinator and Trail Supervisor.

2.0 Planning

2.1 Kootenay National Park Trail Plan

The Wilderness Specialist has been the park representative on the Regional Trail Committee since its inception in 1984. Direct input was made into the formulation of Regional Trail Standards, a Backcountry Facilities Design Manual, and a system of prioritizing trail and campground projects on a park and regional basis.

Two drafts of a background information paper for trail planning in Kootenay National Park have been completed. The last draft, submitted to Region in August 1986, requires only minor changes and will be submitted as the final draft in November 1986. This information paper gives full details of the proposed Capital Program, the O & M program, Trail Use Statistics, and the Inventory and Monitoring program. Refer to the Kootenay National Park Trail Plan, to be completed in January, 1987.

2.2 Backcountry Management Plan

Park Planners at Regional Office are coordinating the formulation of park management plans. In Kootenay, Resource Conservation and Visitor Services have taken on the responsibility of providing the required information. The Trail Plan discussed in Section 2.1 above has been written to tie in with the Backcountry Management Plan as closely as possible. Visitor Services will be working closely with planners and Resource Conservation this winter to complete the Backcountry Management Plan.

2.3 Multi-year Operational Plan

We were successful, once again, in having all projects submitted as PIP documents in 1985 approved for the 1986 season. There were, however, many unfortunate delays connected with person years and the funding for the Floe Lake project was finally received at the end of August, just as the first flakes of snow were landing in the lake. Other parks had similar problems, to the detriment of the trail program throughout the Region.

These delays are costly. They result in lost productivity, late starts, indecision and, in some cases, the cancellation of projects. Funding and person years must be in place by April at the latest in order to implement a properly planned and organized program using limited resources. Backcountry projects are particularly dependent upon tight scheduling and preplanning in order to take advantage of the short work season and to ensure completion of the work on time and within budget. If we cannot commence tender procedures in May or June and begin the actual work as soon as the snow leaves, the success of a project becomes questionable.

The following PIP documents were submitted in June 1986. It will be interesting to see if such an early submission makes any difference to the approval process. June is not the best time to be writing PIP documents, with the field season and contracts in full swing, unless it makes a very real difference to the efficiency of the approval process.

Project	1987/88		1988/89	
	\$	PY	\$	PY
1. Numa Pass Trail Recon.	156.3	0.55	7.8	0.15
2. Tumbling Camp Recon.	84.5	0.55	12.8	0.30
3. Backcountry Signs	15.6		15.5	
4. Backcountry Food Storage	10.9			
5. Floe Lake Camp Recon.	9.9	0.25		
6. Rockwall Trail Recon.	8.9	0.15		

3.0 Capital Program

As a result of Regional and Headquarters priorities and a well supported justification for project funding, Kootenay implemented an ambitious capital program in 1986. More than two years of planning, a detailed inventory and monitoring thrust, and the adoption of Regional trail standards all contributed to a strong position on our part when requesting additional resources.

Strong support on the part of Resource Conservation in the preliminary planning process, the provision of positive and timely EARP documents, and the presence of a backcountry warden in connection with backcountry projects were particularly important.

Environmental Assessment and Review Process

Resource Conservation has played an important role in the planning, direction and review of all capital and major maintenance projects since the development of the Wilderness Recreation Program in 1983. Each capital project reviewed in this report has been screened by the park Environmental Surveillance Officer during the planning stages and throughout project implementation. This includes identification and screening of gravel extraction sites, backcountry crew camp locations, trail alignments and reroutes, and backcountry campground reconstruction and rehabilitation proposals. The E. S. Officer is also involved in monitoring and assessing the success of rehabilitated areas, as discussed in this section.

Project Analysis

A brief review of each capital project follows. For more detailed information please refer to the applicable PIP document, contract specification, Year-End Trails Report - 1986 (appendix 1), and the Backcountry Rehabilitation Project - 1986 (appendix 2).

3.1 Floe Lake Campground Reconstruction and Rehabilitation

Prior to this project Floe Lake Campground was heavily impacted and facilities were inadequate considering the amount of use received. This is the highest use backcountry campground in Kootenay and is in a particularly sensitive alpine area; with the result that the upgrading of this site was of high priority. It was the first campground slated for major reconstruction and rehabilitation in the capital trails program.

3.1 Floe Lake Campground cont.

Funding for this project was approved at various levels right through the winter and spring and received approval from Headquarters in June with a major catch; it was "non-funded" due to the person year content. Since this was the highest priority backcountry project, prior to reconstruction, I received approval from the Superintendent to transfer funds from the less critical portions of the Rockwall Pass project to Floe Lake.

The Floe Lake contract went out to tender at the same time as the Rockwall projects in mid-June. The work was completed on the contract within budget and within the proposed time frame. Had we waited for final approval of both funding and person years, which finally came at the end of August, this project would have been held up another year.

3.1.1 Work Accomplished

1. Campground capacity was increased from 12 sites to 18 sites. Well drained tent pads were constructed and graveled using local gravel screened on the moraine.
2. 8 backcountry tables were installed on gravel pads.
3. Rehabilitation of 300 m² of impacted area by transplanting with native sod from new tent sites and seeding with native grass seed.
4. Complete reconstruction of 300 meters of trail and construction of 200 meters of new trail.
5. Rehabilitation of 250 meters of abandoned trails.
6. The establishment of a monitoring system for monitoring the success of rehabilitation and revegetation techniques. This includes the installation of 10 photostations.

3.1.2 Project Review

Compare the before and after photographs of this project (appendix 4 - Photographs) to see the work that was accomplished. Impacted areas have been successfully rehabilitated using the latest methodology and scientific findings. Formerly barren, poorly drained tent sites have either been revegetated or completely reconstructed using gravel pads, drainage improvements and landscaping.

Campground layout has been improved to separate eating or food handling areas from tent sites. Tables have been provided to attract campers to eating areas and to replace makeshift tables and benches constructed by previous campers. Hardening of the table locations with gravel pads will aid in minimizing impact to surrounding areas, particularly during wet weather.

3.1.2 Project Review cont.

The project has been carried out as planned and was completely successful. Further monitoring, user education, and law enforcement is critical to the long term success of the work accomplished. A time frame of a minimum of five years is proposed to adequately monitor rehabilitation of sensitive areas through the use of photostations and vegetation plots. Ten years is required if the data is to be used for scientific purposes.

3.1.3 Project Follow-up

Funding has been approved in principle for next year (1987/88; \$9.9, 0.25 PY) for the continued monitoring of the success of this project. With the changes in campground layout (separation of eating areas from tent sites) increased Warden patrols, visitor education and enforcement capability are proposed for 1987. An accurate plan of the new campground layout has been prepared and will be dispensed with the backcountry permit to campers destined for Floe Lake. Increased signage is planned to indicate tent sites, food caches, eating areas, and rehabilitated areas.

The possibility of stationing a person at the campground for the summer is being explored. This would potentially be a volunteer or co-operative education student whose main job would be communication with the public and education concerning the changes in layout and rehabilitation. See the Rehabilitation Project Report - 1986 (appendix 2) for further details on rehabilitation and monitoring.

3.2 Rockwall Pass Trail Project

Rockwall Pass Trail, like so many of the other trails in Kootenay, was never constructed to an acceptable standard. In most areas the trail is there as a result of frequent traffic rather than a planned approach to providing a facility for the hiker.

As a result of the Inventory and Condition Monitoring Program it was apparent that the Rockwall Pass Trail was the highest priority for reconstruction, based on resource and visitor use parameters. It is part of the route along the Rockwall, the highest backcountry use area in the park, and crosses expansive alpine meadows with very poorly drained soil and late snow as limiting factors.

3.2 Rockwall Pass Trail cont.

The original proposal was to reconstruct the complete trail from Tumbling Creek Campground to Helmet Falls Campground (12 km.) to the accepted Class 2 - Minor trail standard. When it became obvious that the funding for the Floe Lake project was in limbo it was decided to upgrade the most critical sections of the Rockwall Pass trail and go ahead with the Floe project at the same time.

The Rockwall Pass Trail is 12.8 kilometers in length. The sections requiring the most work were along the alpine portions of the route. These sections were broken down into two separate contracts as follows: Limestone section - reconstruction of 1.4 km. of trail and the construction of a 0.8 km. reroute; Wolverine section - reconstruction of 2.6 km. of trail and the construction of a 0.9 km. reroute. Both contracts were completed on time and within the allotted budget.

3.2.1 Work Accomplished

A. Limestone Section:

1. Reconstruction of 1.4 km of trail to the Class 2 - Minor trail standard. This included widening of the tread to 50 cm. and the installation of drainage measures.
2. Graveling of 1.1 km of trail with 62 cubic meters of native gravel from the glacial moraine. Site was rehabilitated afterwards.
3. Rehabilitation of braided trail and abandoned trail sections by sodding with matching sod taken from new trail and widened sections. 300 square meters of sod were transplanted and treated with rooting hormone and fertilizer.
4. Construction of a 0.8 km reroute to the Class 2 standard, with 50 cm tread width, native tread surface, water bars, and drainage dips.

B. Wolverine Section:

1. Reconstruction of 2.6 km of trail to the Class 2 standard. This includes widening of the tread to 50 cm and the installation of drainage measures; water bars, drainage dips, and ditching. Ditching was extensive on this section through areas of very poor drainage. Material was taken from the ditches and placed on the trail to provide a well-drained, raised tread surface.
2. Graveling of 400 meters of trail with 22.5 cubic meters of native gravel from the same extraction site as for the Limestone contract. This site was reclaimed.
3. Rehabilitation of braided trail and abandoned trail sections

with transplanted sod. 240 square meters of sod was transplanted to contract specifications.

4. Construction of a 0.9 km reroute to the Class 2 standard.

3.2.2 Project Review

The extensive reconstruction and rehabilitation of this trail was a high priority in the Kootenay trail program. The resulting facility has been upgraded to a much more acceptable standard in consideration of environmental, resource and visitor use factors. The work was carried out professionally by contractors using state of the art methodology with highly successful results. (See the Rehabilitation Report for further details - Appendix 2).

The attached photographs are indicative of the quality of work accomplished and the importance of rehabilitating unacceptable areas, particularly in the alpine (see appendix 2).

Graveling

This trail crosses extensive areas of very poorly drained alpine soils and it was decided that the only effective technique available for adequately draining a trail tread through this type of material is with the use of gravel. An excellent site for gravel was located on local morrainal material and was screened to minus 25 mm on site. The gravel was then flown by helicopter to the required section of trail and dropped in location.

The site chosen for gravel extraction is located away from the trail and is relatively inaccessible to the average hiker. Once the gravel had been screened and flown to the trail the site was rehabilitated to the original contours, leaving no visual impairment. This procedure was one of the requirements of the Environmental Screening report and was an integral part of the contract specifications for all projects involving gravel extraction.

The cost of graveling is high; approximately \$20,000 per kilometre of trail including labour for screening the gravel, helicopter time for transporting it by bucket, and labour for spreading it. Only extreme cases of poorly drained soil require this treatment, though, and selective spot hardening with gravel can cover a long stretch of trail.

In our experience with graveling this summer it has become obvious that this is the most appropriate, and effective, treatment for high use trails through poorly drained alpine areas. The difference between a native tread surface of slick, organic material and the dry, firm gravel tread has to be experienced to be fully appreciated. We used a thickness of between 7 to 10 cm of gravel and found this to be more than

adequate in all but the wettest areas with standing water. In one such mud hole a soil separation blanket (Mirafi) was laid into a trench, filled with 10 cm of pitrun (coarse gravel), wrapped over top, and covered with a further 10 cm of screened gravel to yield the final tread. This seems to be effective in crossing an extremely wet stretch of mud and standing water.

3.2.3 Project Follow-up

Funding has been approved for 1987/88 (8.9, 0.15 py) to continue monitoring this project and to ensure that public education, and enforcement of regulations can be carried out on an intensive basis for the initial summer after completion. This is an important aspect of any project, but particularly with a project involving transplanting of alpine sod, revegetation, and rerouting of the trail.

A monitoring program has been developed using photographic stations to monitor the success of revegetation and rehabilitation with transplanted sods and seeding. As indicated earlier this program should continue for a minimum of five years after the completion of this type of project.

3.3 Capital Cost Analysis

3.3.1 Introduction:

The following analysis is based on the three major contracts tendered this summer to complete the required work on the Rockwall Pass trail (Limestone and Wolverine sections) and Floe Lake campground.

In each case the contract went out to public bid and the lowest bid was accepted. In the case of the Floe Lake contract the lowest bidder subsequently backed out because he had misunderstood the purpose of the P. C. Sum as an amount to cover contingency expenditures only. Once this was clarified he realized that his bid would not have been profitable. This resulted in a rearrangement of bidders and the second highest bid was accepted for both the Floe Lake and Wolverine section contracts.

The work required for each contract was laid out specifically in contract documents with detailed plans and drawings, and a mandatory on-site meeting was held prior to the closing of the bids. The requirements were broken down into standard categories as follows: 1. base preparation, 2. surface course (gravel), 3. drainage improvements, 4. transplanting sod and shrubs, 5. landscaping, and 6. P. C. sum (miscellaneous improvements).

Due to the problems bidders encountered with the P. C. Sum, we have decided not to include it in any future contracts. Instead, contingencies, if any, will be covered by Change Orders. More detailed specification of work required will also be included in subsequent contracts, indicating specific numbers of water bars, meters of ditching, etc.

3.3.2 Unit Price Schedules:

The following schedules indicate the estimated quantity of work required for each contract and the successful bid prices, based on these estimates. These prices are indicative of the contractor's estimates prior to the start of each project; and proved to be fairly accurate.

Unit Price Schedule

<u>Description</u>	<u>* Unit</u>	<u>* Est Qty</u>	<u>* Unit Price</u>	<u>* Total</u>
A. Wolverine contract:				
1. Base preparation	Lump Sum.....			\$13,000
2. Surface course	M ³	20	\$577.00	\$11,540
3. Drainage Imp.	Lump Sum.....			\$ 4,000
4. Transp. Sod	M ²	240	\$15.00	\$ 3,600
5. Landscaping	Lump Sum.....			\$ 6,960

Wolverine Contract Total Bid Price				\$39,100
<hr/>				
B. Limestone contract:				
1. Base preparation	Lump Sum.....			\$5,958
2. Surface course	M ³	45	\$158.66	\$7,140
3. Drainage Imp.	Lump Sum.....			\$1,872
4. Transplant Sod	M ²	300	\$ 13.00	\$3,900
5. Landscaping	Lump Sum.....			\$3,105
6. Helicopter	Hour		\$541.35	\$14,400

Limestone Contract Total Bid Price				\$36,375
<hr/>				
C. Floe Lake Contract Total				
1. Base preparation	Lump Sum.....			\$18,510
2. Surface course	M ³	30	\$303.50	\$ 9,105
3. Drainage Imp.	Lump Sum.....			\$ 2,868
4. Transplant Sod	M ²	300	\$ 28.22	\$ 8,566
5. Transplant Shrubs	Ea.	25	\$ 18.40	\$ 460
6. Landscaping	Lump Sum.....			\$ 2,481

Floe Lake Contract Total Bid Price				\$41,990

Note: These are the bid prices only and do not cover miscellaneous improvements under the P. C. Sum which increased the total contract cost in each case.

3.3.3 Cost Comparison

The price schedule tables can be used to compare bid prices between contracts for the same item. The unit prices for the Surface Course (excavating, loading, placing, grading, and compaction of gravel) compare as follows:

1. Floe Lake contract	\$303.50/cubic meter
2. Limestone contract	\$158.66/cubic meter
3. Wolverine contract	\$577.00/cubic meter

Transplanting Sod (preparation, digging, water, fert.):

1. Floe Lake contract	\$28.22/square meter
2. Limestone contract	\$13.00/square meter
3. Wolverine contract	\$15.00/square meter

3.3.4 Detailed Cost Analysis: Capital Projects

A. Rockwall Pass Trail Reconstruction Project

Capital Costs

	<u>Cost Estimate</u>		<u>Actual Exp.</u>	
	\$	PY	\$	PY
Wages				
Project Supervisor	11.7	0.40	8.0	0.30
Rehab. Specialist	--	--	(1) 8.0	--
Resource Protection	--	--	(2) 3.0	0.10
Overtime and Inc.	1.0		1.2	
Vehicle Rental	1.5		2.5	
Material and Supplies	1.6		3.8	
Helicopter	--		(3) 3.9	
	-----	-----	-----	-----
	15.8	0.40	30.4	0.40

Contract Costs

1. <u>Limestone Section</u>		
Labour	25.0	16.7
Helicopter	15.0	14.4
Material and Supplies	11.0	12.9
Vehicle Rental	1.7	--
	-----	-----
	52.7	44.0
Profit and O/H (15%)	7.9	Incl.
	-----	-----
Contract Total	60.6	44.0
2. <u>Wolverine Section</u>		
Labour	25.0	17.0
Helicopter	10.0	13.6
Material and Supplies	12.0	16.7
Vehicle Rental	1.5	--
	-----	-----
	48.5	47.3
Profit and O/H (15%)	7.3	Incl.
	-----	-----
Contract Total	55.8	47.3
	-----	-----
Project Total	132.2	121.7

NOTE: The figures in the Cost Estimate column are not comparable with those in the Rockwall Pass Trail PIP document. The high priority sections of this trail were reconstructed in order to enable us to continue with the equally important Floe Lake Campground project at the same time, as scheduled. (See Capital Program section of this report for details).

3.3.4 Detailed Cost Analysis Cont.

B. Floe Lake Campground Reconstruction Project

Capital Costs

	<u>Cost Estimate</u>		<u>Actual Exp.</u>	
	<u>\$</u>	<u>PY</u>	<u>\$</u>	<u>PY</u>
<u>Wages</u>				
Project Supervisor	7.4	0.25	7.4	0.25
Rehab. Specialist	--	--	(1) 8.0	--
Resource Protection	--	--	(2) 3.0	0.10
Vehicle Rental	1.5		1.5	
Material and Supplies	1.6		2.0	
Helicopter	--		(3) 2.8	
	10.5	0.25	16.7	0.35
<u>Contract</u>				
Labour	29.3		25.1	
Helicopter	21.0		15.2	
Material and Supplies	5.6		6.6	
Vehicle Rental	2.5		--	
Additional Drainage Imp.	--		7.2	
Tables - Labour	1.0		1.3	
- Material	1.5		1.7	
	60.9		57.1	
Profit and O/H (15%)	9.1		Incl.	
<u>Contract Total</u>	<u>70.0</u>		<u>57.1</u>	
<u>Floe Lake Project Total</u>	<u>80.5</u>	<u>0.25</u>	<u>81.8</u>	<u>0.35</u>

Notes for Rockwall and Floe Lake projects:

- (1) Rehabilitation and monitoring had not been adequately addressed for the first year of this project in the PIP submission. Once the project was underway it was obvious that more time was required to ensure complete success. Refer to the photographs for examples of rehabilitation.
- (2) Resource protection was more imperative in the first year than was planned for. This requirement is evident in the photographs, as well. (See photo of illegal campers after signage was in place.)
- (3) Helicopter use became imperative for on-site bidder's meetings and on-site inspections during the course of the contracts due to the late season and scope of the capital program.

3.3.5 Capital Program Considerations

These projects, as well as others, are part of the Wilderness Recreation Program in Kootenay National Park. Over the last three years we have undertaken a planned, integrated program of backcountry facility design, reconstruction and maintenance. None of the projects have been designed to stand alone and all are mutually supportive of the entire program.

There are, therefore, costs that have been charged to certain projects which influence the success of not only that particular project, but others as well and, potentially, the success of the overall program.

Examples of such additional costs are as follows:

Park radios for communication purposes	\$3.6
Trail counters for visitor-use statistics	\$3.2
Trail survey equipment	\$0.3
Electric fences for backcountry camps	\$1.5
Photographic equip. and film for project planning, the monitoring program, and project records.	\$3.0

Remaining requirements of this type include the computerization of the Backcountry Facility Monitoring Program and Inventory with the accompanying purchase of hardware and software, and the purchase of food storage systems for backcountry camps.

3.3.6 Project Cost Estimates

Based on the above costs, considering both projected and actual expenditures, the following guidelines have been prepared by our staff for use in future project estimates.

A: Trail Reconstruction

This figure represents the contract cost of upgrading the Rockwall Pass trail across wet, poorly drained alpine meadows. Much of it required extensive reconstruction, including major drainage improvements such as ditching, raising the trail tread, and installation of waterbars. The material was all flown to the trail location (approximately 15 minutes return). This cost is the base price for reconstruction; rehabilitation of trail braids and spot graveling of wet sections is in addition to this cost.

1. Cost per lineal meter of trail reconstructed to the Class 2 standard with a 50 cm tread width at Rockwall Pass:

4.0 km of trail @ \$27.2 = \$6.8 per kilometre

3.3.6 Project Costs cont.

B: Construction of New Trail

This cost is based on the construction of two reroutes along the Rockwall Pass trail under contract. The trail was constructed to the Class 2 standard with a 50 cm tread width in both cases. The terrain was treed in one contract and open alpine meadows and talus slope in the other. This is the base price, once again, and the rehabilitation and graveling costs are additional.

1.7 km of new trail @ \$22.8 = \$13.4 per kilometre

C: Rehabilitation of impacted areas:

This includes moving and transplanting of sod, preparation of the receiving area (loosening and scarification), fertilizing, and seeding with supplied native grass seed. Transport in this instance is by hand; helicopter use would increase costs substantially. Cutting of sod, when not available as a result of cutting new trail or tent pads, would also add to this cost. These costs are derived from work in the alpine environment.

1. Cost per lineal meter of rehabilitated trail 0.45 m wide:

Labour (0.8 manhours/meter @ \$11/hr.)	\$8.80
Wurzil dip rooting hormone	\$0.85
Fertilizer (organic and time-release)	\$0.05

<u>Total</u>	<u>\$9.70</u>

2. Cost of rehabilitation per square meter of impacted area

Labour (0.8 mh/meter @ \$11/hr.)	\$19.55
Wurzil dip rooting hormone	\$ 1.88
Fertilizer (organic and time-release)	\$ 0.10

<u>Total</u>	<u>\$21.53</u>

D: Graveling of trails and tent pads:

This includes the cost of screening gravel on-site within 5 kilometers of the receiving area, loading, transporting by helicopter, placing, and compacting to a finished tread surface.

1. Cost of graveling per cubic meter

Labour @ \$11/Hr.	\$ 83.40
Helicopter	\$262.00

<u>Total</u>	<u>\$346.00</u>

2. Cost of graveling (per lineal meter of trail, 0.5 M wide and 10 cm thick):

Labour @ \$11/Hr.	\$ 4.70
Helicopter	\$14.80

<u>Total</u>	<u>\$19.50</u>

One cubic meter of gravel covers 18 - 20 meters of trail, 50 cm wide X 10 cm deep prior to compaction

These are only guideline figures, based on the local situation and work accomplished under contract. They are useful as a rough indication of costs to be expected in future projects involving similar terrain, distances, vegetation types, and available expertise.

3.3.7 Capital Labour Costs

Each contractor was asked to submit a breakdown of hours, upon completion of the work, representative of the actual time spent on various aspects of the project.

Breakdown of Hours for Each Contract:

<u>Contract</u>	<u>Function</u>	<u>Hours</u>	<u>% of Total</u>
<u>Limestone Contract</u>			
	Base Prep &		
	Drainage Imp	274	16%
	Rehabilitation	306	16%
	Reroute	169	10%
	Gravel	470	28%
	Camp (cook,etc)	546	30%
	<u>Total M/Hours</u>	<u>1670</u>	<u>---</u>
<u>Wolverine Contract</u>			
	Base Prep &		
	Drainage Imp	612	36%
	Rehabilitation	214	13%
	Gravel	179	11%
	Camp	243	14%
	Add. Drainage	450	27%
	<u>Total M/Hours</u>	<u>1698</u>	<u>---</u>
<u>Floe Lake Contract</u>			
	Base Prep	257	12%
	Rehabilitation	938	40%
	Gravel	378	17%
	Camp	551	24%
	<u>Total M/Hours</u>	<u>2295</u>	<u>---</u>

3.3.7 Capital Labour Costs cont.

Labour Cost Comparison: Capital Park Crew vs Private Contractor

Based on the above tables and the number of hours spent on each project we can make the following comparison. The capital crew rate is calculated on the current average wage of trail crew members, including laborers, chainsaw operators, and foremen. This works out to approximately \$12.50 per hour.

<u>Contract</u>	<u># of Hours</u>	<u>Actual Cost</u>	<u>Cap-crew Est</u>
Limestone Contract	1670	\$16.7	\$21.0
Wolverine Contract	1698	\$17.0	\$21.2
Floe Lake Contract	2295	\$25.1	\$28.7

There are many factors to consider such as the possible motivation to work more quickly under contract, the ability to work longer hours. depending upon the agreement, without overtime, paid holidays, etc.

It is probably safe to say that the labour cost difference between capital crew and contract crew is not a large enough factor to be the primary consideration in this choice.

There are, however, other considerations:

1. With park capital crews more staff would be required than we presently have available in the supervisory and organizational functions in order to:

- arrange and schedule helicopter flights
- organize large crew camps (3 this year)
- schedule work and job locations
- deal with the demands of 18 - 20 employees

The hours required by the contractors (indicated above) are, therefore, less than what could be expected with park crews. Each contractor looked after these organizational details for their own crew, breaking the task into three manageable portions. One person could not be expected to organize and direct all three operations, if they were capital crews, without a great deal of assistance.

2. Time Factor:

The three contractors were not able to start work until the first or second week of August, due to a late snow melt and the tendering procedures. From the time that they started to the time they finished was 4 weeks in each instance. The snow started to fly again just as the last contractor was finishing.

3.3.7 Capital Labour Costs cont.

If this work had been done with capital crews working a regular 40 hour workweek, on a 10 day on/4 day off shift, the work would probably not have been completed prior to freeze-up in the alpine.

The time required to complete this many hours of work on a regular park shift would be as follows:

Limestone Contract	1670 M/Hours X 6 man crew = 7 weeks
Wolverine Contract	1698 M/Hours X 6 man crew = 7 weeks
Floe Lake Contract	2295 M/Hours X 6 man crew = 10 weeks

This extra time requirement becomes an important consideration with any backcountry facility work in alpine areas.

Time frame considerations can be illustrated as follows:

A. Contract Project:

<u>Responsibility Centre:</u>	<u>Park</u>	<u>Contractor</u>
T	Priorizing	Scheduling
I	Planning	Organizing
M	<u>Functions:</u> Cost Estimates	Work Plans
E	Contract Specs.	Implementation
	Inspections	Pay & Benefits

B. Park Capital Crew Project:

<u>Responsibility Centre:</u>	<u>Park</u>
T	Priorizing
	Planning
I	<u>Functions:</u> Cost Estimates
	Specifications
M	Standards
	Inspections
E	Scheduling
	Organizing
	Work Plans
	Implementation
	Pay & Benefits

It becomes apparent that more time is required to do the job with park capital crews because the contractor's share of the work is taken over completely by park staff.

3.4 Backcountry Food Storage Installation - Contract

An improved model of the Kootenay Backcountry food cache design was installed at the four highest-use campgrounds; Floe Lake, Tumbling Creek, Numa Creek, and Helmet Falls. Larger pulleys were added to the otherwise successful prototype. Food caches are now available to 80% of the backcountry campers. The remaining campgrounds will be serviced with food caches under a similar project next summer.

This project was completed very successfully under contract; both under budget and on-time.

3.5 Backcountry Sign Installation - Contract

Fifty signs were installed in the backcountry to replace inaccurate and nonexistent signage in many areas. Trail markers were also installed to mark alpine routes and poorly defined trail sections above tree line. This project was also completed successfully under budget and on-time under contract.

3.6 Capital Program Summary

We were successful this summer in accomplishing high priority backcountry facility projects as identified in the planning process. Most of the work was carried out under contract and within the time frame and budget requested in the MYOP. Due to the success we have experienced with contracts and our own calculations indicating that this approach is both more cost and time effective we plan on proceeding with future projects under contract rather than with capital park crews.

The problems associated with receiving capital person years too late to be effectively utilized on the Floe Lake project, also lead us to believe that this is the most effective approach to completing future work within schedule.

3.6.1 Capital Person Years

Capital person years are still required, though, to provide adequate on-site supervision, resource protection, and rehabilitation and monitoring capabilities critical to the success of contract work.

Contract Field Inspection

Both the park and the contractors require a park representative who is responsible for approval of work accomplished and to discuss problems in the field as they arise. The 0.4 person year received this year for the Rockwall Pass project allowed us to provide a position responsible for supervision of capital contracts.

The contractors confirmed the requirement for this position in discussion and during a contract review meeting on September 18, 1986. The Trail Co-ordinator took on the added responsibility of this position and coordinated all field activities. Person years must be incorporated into the program, on a seasonal basis, to cover this requirement and to ensure that this position is an inherent part of each project.

Rehabilitation Specialist

The success of these projects was also closely linked with the rehabilitation planning and expertise provided by the Wilderness Technician (a co-operative education position at this time). Much of the work involved in rehabilitation and revegetation-transplanting of native sod, seeding with native seed, fertilizing and revegetating of impacted areas - is new to National Park trail organizations.

3.6.1 Capital Person Years Cont.

The Wilderness Technician has done extensive research of the latest developments in this field and in identifying the most successful techniques. This information must be tailored to each individual project and included in the contract specifications to ensure park requirements are met. The monitoring program is presently being developed to ensure the continued success of rehabilitation projects in the future (see Backcountry Rehabilitation Project - 1986). This position is required on a seasonal basis for the duration of the capital backcountry facilities program.

Resource Protection

Resource protection and environmental monitoring aspects were covered by Resource Conservation. The presence of a warden during much of the construction and rehabilitation, and for the first few seasons afterwards, is critical to the success of a project and visitor acceptance of facility design changes. Rehabilitated sites are particularly sensitive to visitor impact and a project costing thousands of dollars can be jeopardized in one season without adequate monitoring, signage, law enforcement and visitor education.

3.6.2 Backcountry Camps: Contract Crews

An agreement has been developed for use by all crew camps in the backcountry (capital and O & M), based on one used in Banff N.P., detailing health, safety, environmental and facility requirements. This agreement worked well by providing guidelines for contractors regarding low-impact camps and food and garbage storage in bear country.

Electric fences were loaned, with solar battery pack, to each of the contractors for the duration of the camp. The fences proved to be effective; there was bear activity in two of the areas but no disruption of either camp. The contractors were positive towards the use of such fences and indicated that this measure contributed to the comfort of the camp through a feeling of security. The approach of loaning them out worked well and is recommended for subsequent years.

Work is presently under way to formulate a bear proof food storage system which will become part of the camp agreement specifications. Two options are presently being looked at; 1) the loan of food storage boxes to each contractor, or 2) the specification of required food storage to be supplied by the contractor.

3.6.3 Contract Review Meeting - September 18, 1986

A meeting with all three contractors, contract supervisor, rehabilitation specialist, and wilderness specialist was held to review and critique the summer's work. Everyone agreed that a great deal was accomplished in a short time with good results. I congratulated all people involved for a good job done. For future reference, I would recommend any of the three contractors for work of this type and would not hesitate to work with any of them.

Two concerns that the contractors raised were; 1) the first payment should be as early in the contract as possible, and 2) radio communications with the other camps and contract supervisor could be improved. I agree with both recommendations and will be addressing them further this winter.

3.7 Capital Program Recommendations: Contracts

After a season of administering the capital project contracts right from the planning stages through to final inspection I am satisfied that trail and campground work can be effectively implemented under contract.

We feel that the completion of backcountry facility reconstruction and rehabilitation projects under contract is the most effective use of capital resources in Kootenay National Park at the present time for the following reasons:

1. Limited available resources for effective organization and supervision of large scale capital crews.
2. An extremely restrictive time frame for work undertaken in the backcountry, particularly in alpine areas.
3. The required expertise is available in the local area and has proven totally satisfactory.
4. Contracts have proven to be both time and cost effective.

If projects of this nature are tackled under contract I would recommend that:

- a. The contract specifications must be well written, accurate and as detailed as possible. They must specify in black and white exactly what is required, what the end result should look like, the acceptable standards, exact location, and time frame.

3.7 Capital Program Recommendations cont.

b. Person Years must be available to ensure satisfactory contract field inspection, planning, and visitor education as detailed in section 3.6.1.

c. A monitoring program should be integral to environmentally sensitive projects in order to ensure long term success.

4.0 Operations and Maintenance Program

The complete O&M trail program, as discussed, came under the control and direction of Visitor Services for a trial period of one year starting in April, 1986. The trail season is now behind us and the following is an objective critique of the successes and failures of this program under the direction of the Wilderness Recreation Specialist within the Visitor Services sub-activity. Refer to the "1986 Year End Trails Report" (appendix 1) for further details.

4.1 Organization

Supervision

The Trail Co-ordinator was responsible for the control and direction of the field aspects of the program, both Capital and O&M, and reported directly to the Wilderness Specialist. This position effectively coordinated all field activities and ensured the most efficient utilization of both manpower, equipment and helicopter time. Kim Baines proved equal to the added demands of the position and was instrumental in the success of the overall program.; This co-ordination, as already mentioned, is critical for an effective, efficient, and viable trail and backcountry facilities program.

An in-park competition was held to fill in behind the Trail Co-ordinator to direct and control the O&M trail crews. This position, the Trail Supervisor, was filled very successfully by Kerry Colonna. With a capital program the size of the one carried out this past summer, the Trail Supervisor position is required to manage the O&M trail crews effectively.

Warden Trail Work

This year, as in past years, the wardens contributed greatly to opening the trails in the spring and keeping them open by clearing deadfall as required. This work is in addition to the regular role of the backcountry warden and assists the trail crews in opening the trails as early as possible and maintaining them, particularly after a strong windstorm.

At the beginning of this summer difficulties were encountered with the frontcountry trail crew in covering trails beyond what they called the "four mile limit"; a self-imposed limit set by the foreman of the crew. This problem was discovered when wardens found themselves doing much of the clearing further up the trails. A clearer understanding of standards and work requirements became necessary between supervisors, wardens, and trail crews.

4.1 Organization cont.

Trail Crews

Trail crews have traditionally been organized along the following lines: May - June, one trail crew responsible for spring opening of trails; July - August, two trail crews: one front country crew consisting of five members, and another backcountry crew with six members.

The following changes were made, while considering the personalities involved and manpower available. The size of the backcountry crew was reduced to four members, under more effective direction in the form of an acting trail crew foreman. The other O&M crew was reduced to four members and third crew of three individuals was organized. This third crew, the roving crew, was equipped with a packhorse for carrying a chain saw and tools and covered more ground than had been possible with either of the other two crews.

This organization was reviewed with the Trail Co-ordinator and the Trail Supervisor at the end of the season. The consensus is that the three crews are more effective and efficient at meeting the requirements of the trail program and a similar organization will be implemented in future seasons.

The horse support for the roving crew worked out well and will be continued. The horse trailer used this summer will be required for transportation.

Two trail crew foreman positions are to be filled next season. It is imperative that the job descriptions for these positions be reviewed and any required changes made to update them. The O&M trail program will be even more effective when foremen with record keeping and supervisory skills are in these positions.

4.2 Standards

In February, 1986, I recommended that "written O&M standards for backcountry facilities must be adopted as soon as possible." The trail crews had, traditionally, not been told what the accepted standard was for trails and campgrounds. What was the tread width, maximum grade, clearing width, suitable tread surface, drainage requirements, frequency of water bars, etc. for a section of trail. Consequently each crew had a different standard and standards varied depending on the weather, the time of day, and general mood of the members.

4.2 Standards cont.

The following steps were taken this summer to correct this lack of standards:

1. A maintenance schedule was drawn up for trails based on the trail classification (to accepted regional trail standards) indicating frequency of maintenance, priorities, and work to be accomplished.
2. Trail crews were instructed to increase the frequency of drainage improvements to prevent further deterioration from water erosion and wet tread surfaces to the same standards specified in the trail contract terms of references.
3. Clearing width specifications, based on trail classifications, were discussed and clarified with trail crew staff. These specifications were adhered to for the rest of the summer.
4. Staff were instructed several times to repair problem areas immediately when accessing a particular job, rather than ignoring them. This lead to fewer kilometers being covered by each crew in the short term but will result in a more consistent, and better, system in the long term. This was offset by the re-organization of existing staff, though, and more kilometers were still covered than in the past, more thoroughly, and with the same number of staff.

This winter I will be preparing a written set of standards for each trail classification which will be applicable to both maintenance work and capital reconstruction projects. The standards will become part of the contract specifications for future contracts, as well.

4.3 O&M Budget

The O&M budget, for goods and services on trails, was cut back from \$14.0 (84/85), \$14.0 est. (85/86) to \$10.5 in 86/87. The actual expenditure in 1986/87 was \$15.0, but this figure cannot be compared to that of previous years because the rates for equipment cost distribution through MMS were substantially increased this year. The amount of equipment usage has been approximately the same every year and if the equipment cost distribution had remained at the same rate the actual expenditure in 86/87 would have been approximately \$9.5. The O & M program was subsequently changed in these areas:

4.3 O&M Budget Cont.

- the number of camp moves was reduced from the usual 3 or 4 to one camp location for the entire summer. At least one additional relocation is planned for next year if the funding is available.
- no helicopter time was provided for the frontcountry crew and no overnight trips were undertaken by this crew. The area covered was reduced.
- the backcountry crew concentrated on a few kilometers of trail in the vicinity of the Helmet-Ochre campground. This included the Helmet, Ochre Creek, and Ottertail trails. Greater coverage is planned for next year.

Due to re-organization of the crews, formation of the roving crew with horse support, and the establishment of accepted standards the O & M crews managed to operate with reduced funding. Operational maintenance, according to trail classification, was reduced to reflect the decreased budget. Class 4, 3, and 2 trails are to be covered twice in a season. The Class 4 and 3 trails were covered twice and the Class 2 trails (the majority of Kootenay's trails) were covered only once.

Next year we plan on:

- covering a minimum of two areas with the backcountry crew, with separate camp locations.
- using the frontcountry crew to cover remote areas, as required, on an overnight basis with helicopter support.
- covering Class 4, 3, and 2 trails at least twice per season.
- continuing the use of the roving crew with horse support to increase the distance covered more effectively

4.4 Training

In-house training will be incorporated as part of the trail crew orientation next summer to familiarize all trail staff with acceptable standards and techniques, and to answer all questions regarding what exactly is expected of every one.

4.5 O&M Program Review

Definite improvements were made in the effectiveness of the O&M program with more open communication between the crews and supervisors, integration of standards, re-organization of staff, horse support in co-operation with the wardens, more effective supervision and the sense that there is a cohesive and unified approach to maintaining and upgrading backcountry recreation facilities. Trail programs are currently high profile, and the feeling of pride and contribution on the part of the staff is one positive benefit.

Trail crews no longer have the sense that they are a forgotten aspect of the park. Information staff, wardens, managers, interpretive staff, visitor services staff and the superintendent all travelled the backcountry this summer and contributed to the general awareness that the trail program in Kootenay is something important and a unit to be proud of.

It is important that all field aspects of trail and campground work be coordinated through one position for the optimum use of equipment and manpower. Without this co-ordination scheduling of capital and O&M, crews becomes ineffective and unwieldy.

As the program improves and gains momentum, the Wilderness Recreation Program will have a positive impact on the public image of Kootenay National Park.

5.0 Statistics

Backcountry use permits were once again used to give us accurate figures on the use of backcountry campgrounds. Information staff once again noted the routes being used to access various campgrounds and this information will give us accurate statistics concerning the use of trails by overnight hikers.

Day use statistics are still the weak point and this area will be addressed in a more organized fashion in the future. One big problem has been the expense and unreliability of trail counter technology. We have used infra-red counters in the past (Kindersley-Sinclair trail, 1984) but had problems aligning the counter so that it was out of sight and still functioning. The reflector is a small target and the unit must be aligned exactly and must not move if it is to provide accurate figures. This is difficult when the counter must be attached to a tree and aligned with the reflector on the other side of the trail, also attached to a tree.

5.0 Statistics cont.

This summer we experimented with the use of a trail counter which is completely buried under the trail and invisible to hikers. It sets up an electrical field and counts every time the field is broken. It is easy to install and proved to be reliable in the field (see Appendix 3 - Trail Counter).

Based on our experience this summer, I have ordered four more of these units to install at high day use trailheads. Units will be installed at the following trailheads in 1987:

Floe Lake	Stanley Glacier
Ochre Creek	Numa Creek
Tokumm Creek	

Accurate use figures are important for planning purposes and will become increasingly important in justifying requests for funding in the future.

These counters will require checking every week. The Wilderness Technician position will be responsible for the installation and maintenance of these counters.

6.0 Volunteer Program

We were fortunate in having had a volunteer, Miss Maria Gauger from Germany, with the Wilderness Recreation program this summer. Maria is a well-qualified landscape architect and provided a valuable addition to the program.

She volunteered to Regional Office last winter and I was approached by Lynn Whittingham, Volunteer Co-ordinator, concerning the possibilities of having Maria work in Kootenay. I jumped at the chance and was not disappointed.

Maria produced a detailed plan, to scale, of the Floe Lake Campground Reconstruction project indicating the location of all facilities, rehabilitated areas, new tent pads, etc. This plan will be the basis for a handout to be given to campers destined for Floe Lake and will play a large part in the visitor education program scheduled the next summer.

6.0 Volunteer Program cont.

I believe that the time that Maria spent with us was rewarding for her as well as for us. I will make further use of volunteers in the future if the opportunity presents itself. The stationing of an individual at Floe Lake for the summer next year presents itself as a perfect situation for a volunteer, as one example.

Maria contributed 170 hours of work to the organization. Of this time approximately 100 hours were spent on-site in the field and 70 hours were spent in the office preparing the final plans.

7.0 Wilderness Recreation Program Recommendations

Since the inception of the Wilderness Recreation Program in 1983 I have had the opportunity of contributing to the effective management of backcountry facilities in Kootenay and, as a member of the Regional Trail Committee, in the region. I feel proud of the organization I am a part of and believe that parks is on the right path, or should I say "trail". National Parks are currently involved in some of the most responsive, state-of-the-art backcountry facility management projects in North America. To do so while preserving the environmental integrity of the resource base has to be our over-riding concern.

A Round of Thanks...

I would like to thank management at the regional level, and here at the park, for the support they have demonstrated over the past three years. It speaks well for the organization that we managed to identify some problems, came up with solutions, planned our requirements, and implemented some cures - all in three short years.

The park managers in Kootenay have all been a tremendous help in getting our program off the ground and in ensuring that resources were made available to facilitate wherever and whenever they could. Thanks also to all the people who ran off contract documents, kept track of invoices, did computer print-outs, and worked along with me to keep up the momentum.

I also want to thank Martha McCallum, in region, for taking great interest in the work taking place in Kootenay this summer and for all of the support she has provided for this program every step of the way.

Recommendations

Based on my involvement and, particularly, on our experience gained this past summer with more crews, contracts and resources available than ever before for backcountry facilities in Kootenay, I make the following recommendations:

1. The status of capital project funding and person years must be established as early as possible prior to the start of the field season. April is the latest acceptable month to receive confirmation that dollars and person years are available. This is critical if the program is to be effective.

7.0 Recommendations cont.

2. Strong ties and consultation between sub-activities must be encouraged with regard to all backcountry management considerations. One strength of the present program is the close working relationship between all of the sub-activities and this program.

3. Rehabilitation and monitoring must continue to be a major thrust of this program. Extensive backcountry resource experience must remain a strong voice in the upgrading and continued development of backcountry facilities. The success of projects this summer was largely dependant upon the rehabilitation and revegetation of many square meters of trail and impacted campground. Monitoring of the success of such work is required for informed decisions regarding facilities and backcountry management in the future. This aspect of projects must be built into every step; from inception and planning to final inspection and ongoing review.

4. An up-to-date and meaningful backcountry facility inventory must be maintained. This means regular updating of the present inventory as both capital and O&M work is complete. The inventory is already over a year out of date. Computerization of the relevant data and the person years to keep it current are required. This task must be addressed this winter to keep our heads above water. Computer technology must become part of the Wilderness Recreation Program soon.

5. A day use statistics program must be initiated based on experience gained in past years. A more accurate reading of the amount of day use occurring in the park will be mandatory in the near future to justify the expenditure of resources in these areas.

6. Tighter specifications are required for use in contract documents, maintenance standards, and all facility improvement and development. Much of this work has already been done and it is a matter of making small refinements and additions to existing specifications.

7. The Wilderness Recreation Program is currently a viable, dynamic unit responsible for the management of backcountry recreation facilities in Kootenay National Park. The success of the overall program is evident from the positive results as reported in this review document. I strongly believe that the present situation in terms of reporting relationships, responsibilities, and organization has proven effective. Any changes to the present organization must be weighed very carefully in consideration of the following requirements:

7.0 Recommendations cont.

1. There must be a strong PLANNING CAPABILITY;
2. a viable and current INVENTORY AND MONITORING PROGRAM;
3. a state-of-the-art REHABILITATION PROGRAM based on knowledge of the resource;
4. effective written COMMUNICATIONS in the form of reports;
5. effective SUPERVISION and ORGANIZATION of all aspects of field work; and
6. effective RESOURCE PROTECTION and VISITOR EDUCATION.

Trail organizations are effectively controlled and directed under Visitor Services in some parks, under Resource Conservation in others, and under General Works in still others. It depends on the size of the program, the staff, and management's objectives.

Considering the size of the program involved, the experience of various staff members, and Visitor Services' record in the last three years of getting the job done I can only recommend that the Wilderness Recreation Program be allowed to continue in the direction that we have set for it after much consideration and deliberation in the past.

APPENDIX 1

1986 YEAR-END TRAIL REPORT

Prepared by Kim Baines
Trail Co-ordinator

1986 Year-end Trails Report
Prepared by Kim Baines
Trail Co-ordinator

A. INTRODUCTION

This year was a very successful year for trails in Kootenay National Park. Some changes were implemented in the operation and maintenance section of trails. The operation of these crews went well and a lot was accomplished with a limited budget. One of the major changes was the reduction in size of both the front country and the backcountry crews to four persons each. This enabled us to utilize the remaining three persons to form a third crew. This crew was aided by the use of a horse which also proved to be quite successful.

Major trail reconstruction and upgrading was completed under contract this summer. Major changes were made at Floe Lake with the upgrading of Campsite #12 and the complete closure of Campsite #13. Rockwall Pass trail also received considerable work this season. The majority of the alpine section of this trail was upgraded to approved standards and several sections were rerouted completely. Food cache poles were installed in high use backcountry campsites and the installation of the remainder of new backcountry signs and markers was completed this year.

Because of the increased workload, another person was required to assist me with the field supervision. Kerry Colonna was the successful candidate and assumed supervision of the O&M trail crews. This allowed me to concentrate on the contract work which took the largest portion of my time this season. Kerry started on June 9 and I was able to work closely with him for much of the first month as we were unable to get started with most of the contract work until July. This was due to the late season in the high country this year. Snow remained on many of the trails until well into July. Although it was a slow start for the contracts, the weather cooperated quite well in August and a lot was accomplished.

B. SUMMARY OF WORK COMPLETED

1. Operation and Maintenance Trail Program

The budget for the O&M crews was reduced this year as follows:

1984/85 Goods and Services	\$14.0
1985/86 Goods and Services	\$14.0 est.
1986/87 Goods and Services	\$10.5*

* as noted on p.27 the actual expenditure was \$15.0 because of an increase in MMS equipment cost distribution rates. Without these increases the expenditure would have been approximately \$9.5.

Note: the P. Y. content (4.43 PY) has stayed the same over this period and was not reduced in 86/87.

Certain changes were made in order to use the manpower more effectively and accommodate the lower budget. A third crew was established by reducing the number of persons on both the backcountry and front country crews. This provided better coverage of the trail system. A horse was also available for use by this third crew. This increased their mobility and allowed them to go into the backcountry for short overnight trips.

The backcountry crew was not as mobile this year as it has been in the past. Helicopter time was cut in an effort to stay under budget. It was fortunate that we could find one camp location where enough work was available to keep this crew busy for 4 ten day trips. Their camp was set up at the Helmet-Ottertail junction and all their work for July and August was done out of this location.

The front country crew performed routine trail maintenance working daily from the Compound. This crew was not as seriously affected by changes that were implemented this season other than the reduction in size from five to four persons. This reduction did not seem to seriously affect their work performance. This crew did not have any helicopter time this season, either, although they did assist when wood was being flown in to Fay Hut. For a more complete summary of work completed this summer by O&M crews, refer to Kerry Colonna's O&M trail crew report (copy in this appendix).

2. Capital - Contract Trail Program

The following is a brief summary of the work that was completed under contract this summer. For exact details, (ie: measurements and specifications), reference should be made to the individual contract documents.

a. Floe Lake Campground

Planscape (A. Cernenoks and P. Pankovich) was the successful bidder for the Floe Lake contract. These contractors flew in on August 1 and set up their camp on the south side of the lake on the morrainal material. This was an excellent location for the camp as very little environmental impact occurred and very little rehabilitation was required when the camp was removed.

Floe Lake Campsite #12 received major reconstruction. Eighteen tent pads were constructed. Four of these were placed in already impacted areas and the remaining pads were placed in various locations on the bench above the old tent sites. The tent pads were constructed with 6" x 6' treated wood perimeters and were 3m x 4m in size and surfaced with 6 to 8 cm of screened gravel. Several meters of new trail were constructed to provide access to these tent pad areas.

Many of these new trails, as well as sections of existing trails, were graveled. Gravel was obtained from a source adjacent to the contractor's camp on the southeast end of the lake. The gravel source was morrainal material on the far side of the lake from the campground, screened from view by the moraine itself. This was also the location of the contractor's camp. Due to the nature of the location impact to the area was negligible and rehabilitation consisted of raking the area to a smooth contour.

Eight backcountry tables were installed. These tables were put in two separate already impacted areas. They were placed on a 3m x 3m graveled pad similar to the tent pads and buried 18" into the ground. The tables themselves were constructed under a separate contract earlier in the season so that they would be ready for installation in August.

Extensive rehabilitation work was required under this contract. All heavily impacted areas, including the old tenting areas along the main trail, were rehabilitated. Many old trails were screened or completely rehabilitated and some of the existing trails received rehabilitation work along their edges where they had become excessively wide. Rehabilitation of these areas involved the use of the sod cut from the new tent pad areas and trails. This sod was transplanted using rooting hormones and fertilizers and was planted in varying proportions with native seeds depending on the specific location. Most of this sod was moved from one location to the other by hand but on one occasion a helicopter was used to move the sod to various locations.

As part of this contract, the trail into the campsite from the top of the switchback was upgraded for the first 100m. This was graveled and drainage was improved. Trail braids and impacted areas were rehabilitated along this section of trail. A hitching rail and pad was also installed adjacent to the existing warden cabin. The pad was built using 6' x 6" treated perimeters and gravel similar to the tent and table pads.

Floe Lake switchbacks, Campsite #13, was eliminated as part of this contract. The five boxes were removed and the outhouse was flown up and installed in a new location at Campsite #12. The impacted area was scarified, seeded, screened and received shrub transplants.

The contractors doing this work used a Bell 206B helicopter for the majority of the flying that was required. A Bell 204 was used for flying the gravel. This is a larger machine and was more efficient in moving large quantities. It could haul between .45 and .51m³ of gravel per load and would make a round trip from the gravel source to the campsite every two minutes. Thirty-seven cubic meters of gravel was flown in a matter of a few hours using this machine. Thirty cubic meters were used for the tent pads, table pads and trails in the campground area, five cubic meters was used on the trail between the campground and the top of the switchbacks and two cubic meters was used for the hitching rail pad.

This contract went very well and was completed on September 2, 1986.

b. Rockwall Pass - Wolverine Section

Don Yanko was the successful bidder for this contract. Don flew in on August 5 and set up his camp adjacent to the park boundary in Wolverine Pass. This was a good location except that water had to be hauled from a creek 150m away.

All phases of the project, including selection of appropriate camp locations, were conducted according to guidelines laid down in the initial E.A.R.P screening conducted by the Park Surveillance Officer.

Under this contract, 2.6 km of trail was completely reconstructed to meet existing standards. Narrow sections of trail were widened and drainage was improved. A 0.9 km section of trail was constructed to replace the old trail which had gone through the wet alpine meadow area north of Wolverine cabin. The new trail is located on the scree slope to the west of the meadow. The old trail was completely rehabilitated for the first 100 m on either

end in any areas where it would be visible from the new trail. Sod cut from the new trail construction was utilized for this rehabilitation. The remainder of the old trail was scarified and seeded. A section of the trail to the north of the main reroute required extensive drainage improvements. Water bars were installed as required and stepping stones were placed in the ravines. Another short reroute of approximately 100 m was constructed to relocate the trail to a better location through one of the ravines.

Portions of the new trail that were located in the meadows on either end of the rock scree were graveled as were two other shorter sections of trail to the south of the reroute. Twenty-two and one half m³ of gravel were flown in and put in place. Over 400 m of trail was graveled. The gravel was flown from a site located north of the contract area where it was screened and stockpiled beforehand. To fly this gravel, a Bell 206B helicopter was used. This machine needed between five and six trips to haul 1m³ of gravel.

The 206 was a good machine for spreading gravel on trails. The smaller volume of the gravel barrel allowed for more accuracy in placing each load and saved on the amount of work required afterward to clean up and spread the gravel along the trails. The 206 required three to four minutes for each round trip between the gravel source and the site on the trail.

c. Rockwall Pass (Limestone Section)

A's Landscaping (Rob Heatherington) was the successful contractor for this contract. Rob flew his camp in on August 8, 1986. The location we chose for his camp was adjacent to Limestone Creek at the south end of the contract. This was an excellent location as it was off the main trail, close to good water and in a site where little impact would occur.

This contract involved the upgrading of 1.4 km of trail as well as the construction of an 800 m reroute. The reroute was constructed through alpine/sub-alpine vegetation near the top of Rockwall Pass. The old trail was rehabilitated one hundred percent for the first 100 m on either end and the remainder was scarified and seeded as it was not visible from the new trail. A great deal of rehabilitation work was also required along the remainder of the trail. All double treads were eliminated. The main trail was upgraded to existing standards and drainage was improved by the installation of water bars, drainage dips, etc.

As part of this contract, approximately 62m³ of gravel was screened and placed along the trail. Eleven hundred meters of trail was graveled. It was flown and placed with both the Bell 206B and the 206L. Both machines worked well although the 206L was able to fly slightly heavier loads than the 206B.

The gravel source was located just south of Heatherington's camp (the same location as the source for the other Rockwall contract). This location had been approved within the parameters of the E.A.R.P. screening during the planning stages.

One round trip from source to trail took from two and one-half to three minutes depending on the distance to the trail section.

One 50 m section, which had been very muddy in the past, required a layer of Mirafi in conjunction with the gravel.

This contract was completed and the camp flown out on September 3, 1986.

d. Food Cache Installation

In September, 14 food cache poles were constructed and installed at the highest used backcountry campsites. The successful contractor for this project was Donco Construction. The following is a list of campsites and number of poles installed:

- 1) Floe Lake Campsite #12 - two new poles installed -- two were installed as a test project in 1985;
- 2) Helmet Creek Campsite #6 - four new poles installed;
- 3) Tumbling Creek Campsite #10 - four new poles installed; and
- 4) Numa Creek Campsite #11 - two new poles installed. These poles were installed temporarily as this campground may be moved in the future, two additional poles were constructed for this campsite and are presently stored in the works compound.

Installation of these poles went quickly. They were all flown in one day and were installed over the following two days. Two separate two person crews were used on horseback to do the installation.

e. Backcountry Sign Installation

Forty-five backcountry signs were installed this season. Over 20 alpine trail markers were placed in the Ottertail and Ball Pass area. All backcountry trails are now properly marked with accurate porcelain-metal signs and fiberglass markers.

f. Other

Two additional smaller contracts were tendered this year. One involved the construction of the tables that were installed at Floe Lake. These were constructed earlier in the season so that they would be ready when required. The other contract involved the construction of eight gravel barrels to be used during the gravel hauling operations. These barrels were also constructed earlier in the season so that they would be ready when required. Some minor modifications to strengthen the door may have to be made to these barrels before next season if they are to be used again.

C. RECOMMENDATIONS

1. O&M Crews

a) The implementations of a three person roving crew this season and the resulting reduction in size of the front country crews proved successful. This crew provided increased coverage and allowed for better utilization of manpower. I would like to see this situation repeated in coming seasons. The ability of this crew to use a horse for packing their equipment was also a useful addition to the trail program. Without the horse this crew would not have been able to provide the coverage it did. I would recommend that the horse be made available again next year. We will have to look into acquiring the necessary horse equipment for trails.

b) If at all possible, I would like to see the budget for the O&M trails operation restored to previous levels next year. This year the front country and backcountry crews were limited by the funds allotted for helicopter time. The front country received no helicopter time at all, where in the past they have used two to three hours for backcountry travel each season. The backcountry crew camp was flown in and remained in one place all summer. In the past this camp would move every two to four weeks to provide higher levels of maintenance to more backcountry trails. To move the camp once, often requires one and one-half to two and one-half hours.

2. Capital Trail Work

a) A great deal of work was done under the capital program this season. The addition of another person to assist me with the field supervision of the O&M crews was a good move and, in my opinion, very necessary. The addition of the Trails Supervisors position allowed me to spend the majority of my time with the contractors. It would have been very difficult, if not impossible, for me to provide adequate field supervision to both the O&M and the capital operation on my own.

The reporting relationship between the Wilderness Specialist, myself and the Trails Supervisor worked very well. A person in a full time position on trails is necessary considering the amount of work required. If the same magnitude of work is considered for coming seasons, as is presently planned, I would recommend that a similar organization structure be established for the trails operation.

As this was our first season with such an extensive trail program, I feel it was a learning experience for all involved. Overall, everything went very well. Because of the experience gained this season, next year's operation should prove even better.

b) Providing gravel for trail surfacing and facilities was a major expense under the capital program this season. The screening of the gravel, before it was moved, consumed many manhours. The flying of the gravel from the source to the required site was the most expensive part of the operation. Several different sizes of helicopters were used by the various contractors, including the Bell 204, 206B and 206LK. All the machines worked quite well for the individual operation. The smaller machines were better for trail graveling because the load was smaller and permitted the gravel to be spread as it was hauled and very little was spilled over onto the sites of the trail. The 204 was very effective with its larger capacity at Floe Lake where larger dump sites were available. The large majority of the gravel was required in the tent and table pads, where larger quantities of gravel could be stockpiled and later spread on the trail.

The graveling operation went smoothly; the finished products are excellent and should last for many years. An average of $.85\text{m}^3$ of gravel was used for each $3\text{m} \times 4\text{m}$ tent pad and the table pads, which were $3\text{m} \times 3\text{m}$ took an average of $.7\text{m}^3$ per pad. This was at an average depth of 7.0 cm. One cubic meter of gravel would cover 18 - 20m of trail 50 cm wide and 10 cm deep before being completely compacted. Where the trail tread was deeper, additional gravel was used, thus reducing the distance covered.

c) For the past seven years trail crews have worked a ten hour day, four day week. This has been very effective because of the distances that have to be covered and the time required to get to work locations. I have worked both an eight hour day and the ten hour day on trails and find that the ten hour day was much more effective on trails.

O&M Trail Report - 1986
Prepared by Kerry Colonna
Trail Supervisor

The 1986 season in Kootenay National Park was one of change. In previous years the trail maintenance in the park was completed with two seasonal trail crews. This year a third crew was introduced to the maintenance schedule, it consisted of a foreman, chain saw operator and a laborer. With the assistance of a horse, this gave us a maintenance crew that worked out of the compound on a daily basis. A backcountry crew worked four 10 day trips over the summer season and assisted the O&M crew both before and after they did their backcountry trips. As stated above we had a third crew to help maintain and improve trails and bridges as required.

With the three crews, it was a very successful season for the O&M trail program as they allowed us for better coverage and also allowed us to concentrate on some major brushing and upgrading such as the complete brushing back of the Floe Lake trail. As the third or roving crew was introduced it made it possible to maintain and improve trails and bridges on the longer trails and passes at far less expense as it lessened the need for helicopter time substantially.

The weather in the 1986 season contributed to the workload of the trail crews this year. First, a very hot spring led to the rapid melting of snow at higher elevations resulting in many trail and bridge washouts. Almost immediately after it turned to cloud and rain for most of June and July resulting in further water damage and poor working conditions.

WORK COMPLETED

Front Country (O&M Trail Crew)

This crew started the 1986 summer season on April 28th with a foreman, a chain saw operator and three laborers. They worked this way on the initial cutting and cleaning of trails until July 7th when one laborer was removed and put with the roving crew. This change was successful as the crew was able to complete the jobs assigned them with no problems or delays.

A. Initial Trail Clearing

As the snow in the Radium area melts early in the spring, the O&M crew was able to start clearing and repairing trails as required on April 28th when they started the 1986 season. The crew was successful in clearing all trails around Radium and the Aquacourt as well as Cobb Lake and Dog Lake before the May long weekend.

As the weather and time permitted, the crew worked their way north and continued with routine clearing and maintenance on the remainder of trails and fire roads.

At this time, the crew also was able to do minor repairs and brushing of some of the campsites as well as the installing of water bars, etc. With the assistance of the backcountry crew, which started on June 2nd, the initial cutting and clearing of all trails was completed on June 26th of this season.

B. Dog Lake

The O&M crew replaced a 9m bridge at the north end of Dog Lake they were able to use the same decking and had only to replace the stringers. This bridge was also treated with preservative so should last. They also had to clear out a 75 m. reroute near this bridge since the high water during spring runoff covered about 20m of the trail.

C. Pitts Creek

This trail had become run-down and grown in; the O&M crew went in and cut it out, brushed it back and marked the route.

D. Floe Lake

This season the Floe Lake trail received a lot of attention. We concentrated our efforts on improved drainage where required and brushing back and clearing the entire trail, including the alders in slide paths. With this completed the maintenance on the Floe Lake trail should be minimal for the next few years.

E. Fay Hut

On August 19th, four sling loads of firewood were flown to Fay Hut. Willie Schmidt also went in with two laborers to replace the top of the chimney as well as repair the roof around the chimney. Three laborers went in again on August 26th to finish packing the wood over to the hut so it could be found in the winter. This also allowed them to cut and clear the trail on the way out.

F. Other Accomplishments

As well as the tasks previously mentioned, the O&M trail crew was also able to supply firewood, do brushing and continue routine maintenance on the trails and campsites in the park, as well as patrol trails and bridges at times of high water and remove log jams where required, keeping the damage due to flooding to a minimum. The crew, under emergency measures, was required to drill and blast some rip rap for highways as the washouts that occurred in the spring were too extensive for the amount that was stockpiled.

BACKCOUNTRY TRAIL CREW

This crew, which started the 1986 summer season on June 2nd, consisted at first of one foreman, one chain saw operator and four laborers. This crew, until July 8th, assisted the O&M trail crew with the initial clearing, cutting and minor repairs, which were required on the trails that the O&M crew had not as yet been able to complete. Also, during this time, the crew was able to split up at various times which allowed them to reconnect the suspension bridges which had been released in the fall to reduce damage from snow and ice load over the winter.

With the 1986 season there was a restructuring of the crews to allow us to introduce a three man roving crew. With this in mind, it was necessary to take two people off of the backcountry crew. This change left them with one foreman, two laborers and a cook for their ten day backcountry trips. These trips started on July 8th and consisted of ten eight hour days with two hours overtime per day. This year's O&M budget made it necessary for the backcountry camp to remain at the Helmet-Ochre junction for all four backcountry trips.

A. Trip Number One

On the first trip the crew and camp was flown in on July 8th and one and one half days were spent setting up two sleeping, one cook and a shower tent as well as cut wood and prepare site for summer. The crews objective was to cut out and build a .27 km reroute around a constantly muddy section of trail 1.7 km up from the Tumbling-Ochre junction (photos available in park). This job consisted of cutting out, grubbing tread, brushing back trees and branches, dragging same into bush and installing drainage where required. It was also necessary for the crew to screen and rehabilitate the ends of the old trail for the first 100 meters. This reroute was approximately 1.5 km from where they had their camp set up.

The crew then installed some drainage on other parts of trail, as required, and replaced a bridge approximately 1 km from the Tumbling-Ochre junction. The weather for this trip consisted of cloud and rain for the entire ten days.

B. Trip Number Two

The crew was flown from the Paint Pots on July 22nd and their objective was to reroute around a continuously wet section through a slide path which made it impossible to install drainage or upgrade the trail. It also included the installation of a 5 m bridge across a small stream. There was not much cutting and clearing to do, so the crew was able to complete this .16 Km reroute, plus install drainage and make other improvements between the camp and the site of the reroute, 1.74 km above Helmet-Ochre campsite. On this trip, the weather was again cloudy and rainy.

C. Trip Number Three

The objective was to move the Ottertail Pass trail head from the top of the hill .3 km from the Helmet-Ochre campsite right to the campsite. This allows the same bridge across Ochre Creek to be used for both Ottertail Pass and Helmet trails. The old Ottertail Pass trail followed the top of the bank for a short distance and crossed the creek where a bridge was not feasible because of the span and the steep bank. This was a .55 km reroute through thick brush and it took the crew fourteen days to complete. The weather cleared and was sunny and hot for this trip.

D. Trip Number Four

On the fourth and final trip of the 1986 season, the crew was again flown up to Helmet-Ochre junction. This trip was necessary to complete the Ottertail Pass reroute, go back over the two previous reroutes, improve them and clean up some of the brush from sides of trails. On this trip the crew was also able to brush back other sections where required. On the last day of the trip, the crew packed the camp so that on the following Tuesday, August 26th, the gear could be flown out with minimal helicopter time.

E. Other Accomplishments

In addition to the above accomplishments, the backcountry crew was able to supply firewood, clean and maintain the Helmet-Ochre (#4) and the Tumbling-Ochre (#8) campsites on a regular basis. During the week remaining in their season this crew worked out of the compound assisting the O&M crew with routine trail maintenance and preparing the camp supplies for the 1987 summer season.

ROVING TRAIL CREW

On July 7th of this season, a three man roving crew was introduced to the trail program. It was necessary to reduce the O&M trail crew by one laborer and the backcountry crew by a foreman and one laborer, to enable us to do this. This crew, with the assistance of a pack horse, was able to provide better coverage and perform improvements on longer trails in the park. The roving crew proved effective this season spending as many as three nights in warden cabins on the backcountry trails. This allowed them to stockpile wood at the cabins and campsites, perform drainage and tread improvements, install bridges and clear trails more effectively and with less expensive than with a helicopter.

WORK COMPLETED BY ROVING CREW

A. Wolverine Area

On this trip, the crew spent two nights in the Wolverine warden's cabin. This allowed them to perform routine trail maintenance on the Tumbling Creek trail as well as repair tent pads, brush out, clean and supply firewood to the Tumbling campsite (#10). Damage to the bridge at Limestone-Rockwall, due to the snow load over the winter, was repaired. This was a 35 km return trip; staying in the cabin allowed the crew to make improvements to the trail and Tumbling-Ochre campsite (#8) on their way out.

B. Helmet Falls

On this 36 km return trip, the crew stayed at the Helmet Falls warden cabin for two nights clearing brush out and supplying firewood to both the campsite (#6) and cabin. While there, the crew also repaired porcupine damage to the outhouse. Minor improvements to tread and drainage were performed as the crew hiked in and out.

C. Floe Lake

On this trip it was necessary for the crew to spend two nights in the cabin and repair 25 m washout at top of switchbacks near lake, as well as install and replace water bars and culverts where required. It was also required of the crew to clean, brush and supply firewood to the Floe switchback campsite (#13). This trip was 21 km return.

D. Verdant Creek

On this trip four bridges, washed out during spring runoff, were replaced using native materials. Both trail and campsite #16 were brushed out and the warden cabin and campsite supplied with firewood. The trail from the cabin to Talc Lake was cleared and marked and the crew stayed three nights in the cabin. This was a 42 km round trip.

Other Accomplishments: Roving Crew

When this crew was not out overnight, they worked out of the compound and assisted the O&M trail crew with routine maintenance and minor improvements on several of the other trails in the park. The introduction of this crew contributed greatly to the success of the trail maintenance program of Kootenay National Park this year by allowing us to provide better coverage, upgrading more kilometers of trail with a reduced budget. I would like to see this crew utilized again next season.

PROPOSALS AND RECOMMENDATIONS FOR 1987

Backcountry Crew

I would recommend that one of the two people taken off this crew this year be replaced, from the other crews, to increase its size for next year. This crew has a large work load and the work is often demanding; one more person would lessen the individual work load and possibly improve production.

Roving Crew

It is imperative to have a person on this crew with a good knowledge of horses. Some care should go into hiring a person with horse experience for next year. This may be necessary if Bruce Statham does not return for the 1987 season. The sharing of a truck was a problem at times with the backcountry crew.

O&M Crew

This crew seemed to handle the routine trail maintenance and perform minor improvements quite adequately. I think that this crew worked well as a four man crew and I believe it should be repeated in the 1987 season.

RECOMMENDATIONS FOR 1987

Numa

As the Numa campsite is to remain for quite some time, it would be a good idea to have a crew go in for two or three nights early in the 1987 season to clear, brush out, rebuild tent pads, move the outhouse, supply firewood and clear the old trees and branches that have accumulated around the campsite. An E.A.R.P. screening will be conducted prior to doing this work.

Simpson River Trail

This trail goes through the middle of a boggy area 7 kms from the trail head which can not be avoided. A crew should go in for eight to ten days to install corduroy through this section. There is a lot of horse traffic on here and this is the only solution to the problem.

Kindersley Trail

There is a washed out section of this trail 4 km from trail head, through a slide path which cannot be avoided, The switchbacks should be graveled and much better drainage through the installation of water bars is required. There is no native material in area so gravel will have to be flown in by helicopter.

Talc Lake Trail

The trail to Talc Lake from the cabin is very difficult to find, a crew should go in for two or three days to cut back and widen trail.

Fay Hut

If it is decided that the cabin will remain with the park, the roof must be replaced. The helicopter pad is rotten and unsafe and should be rebuilt. The outhouse is a constant problem since there is no way to dig a new hole in the rock that surrounds the cabin. An alternate way of dealing with human waste should be considered.

Other Recommendations

There are still some areas of trail maintenance being neglected and I believe it would be beneficial to give a good orientation to the working foremen and crews before the 1987 season starts.

I also recommend that a similar trail program be continued in the 1987 season since the three crews we had this year were very effective and allowed us to accomplish much better trail maintenance and upgrading than in the past.

APPENDIX 2

BACKCOUNTRY REHABILITATION PROJECT

1986

Prepared by Tim Van Egmond
Wilderness Technician

Rationale

In order to provide backcountry recreation facilities of a high standard an integrated rehabilitation/upgrading approach must be taken. The campsite plan at Floe Lake has taken many aspects of usage and recreational preference into consideration. The success of a rehabilitation plan is based on the elimination of trends which cause negative impact. The use of well-drained tentsites, tables and hardened trails will serve to keep a large proportion of traffic off peripheral zones. This will enhance the success of the revegetation project and reduce future impacts by enticing users to those zones prepared to absorb the impact.

Materials

Fertilizer

All information currently available stresses the importance of fertilization in any rehabilitation project at high altitudes. Fertilizers were therefore used in this project to ensure a high chance of success with plant survival, establishment and spread on the rehabilitation areas.

The use of the two different types of fertilizers, time-release and immediate release, was recommended to provide both immediate nutrients in a nutrient-poor soil medium and to provide nutrients for future plant development without the necessity of future fertilizer applications. The Osmocoat fertilizer, designed to provide nutrients for up to nine months, will come into effect when nutrients are needed as moisture conditions become proper for plant growth next spring and should continue to release nutrients for the next two growing seasons. While advantages are evident in theory to promote the use of time-release fertilizer as a one-application-does-all, their use at high elevations is not well documented and should be accompanied by immediate release fertilizer. Viability of time-release fertilizers at high elevations must be determined.

These fertilizers were used in areas receiving native sod, seed, or both, and in areas of damaged vegetation which are masked off for natural regeneration. When making a fertilizer recommendation for a high altitude area factors to take into consideration include the fertility of the soil, soil pH, vegetation requirements, climatic variables which will affect the release of nutrients and the fact that vegetation must harden before the onset of winter.

Rooting Hormone

Rooting Hormone

Prior to transplanting, Wurzil-Dip rooting hormone was applied to all native sod at an application rate of 25 gallons (diluted mixture) per 200 sq. feet. The use of rooting hormone provides an alternate source of Phosphate fertilizer and promotes immediate root elongation at the tips of the roots which come into contact with the soil in which the sod is planted. This ensures that the newly planted vegetation has a high chance of taking hold in its new growth medium, reduces the chance of frost-heaving and increases the possibility of invasive spread and seed production on the site in the next growing season.

Seed

Native grass seed was supplied to the contractors by Kootenay National Park. The seed was obtained from Western Regional Office (supplied under research contract from the Ellerslie Experimental Farm at the University of Alberta) free of charge to Kootenay. The seed species used for the Rockwall contracts and Floe Lake campsite #12 were a mixture of *Deschampsia caespitosa*, *Poa alpina* and *Trisetum spicatum*. The Floe Switchbacks campsite #13 was seeded with *Agropyron trachycaulum* and a small percentage of the above three species.

All of the grasses used are rated as compatible with native species and only moderately aggressive. These characteristics favoured the use of this seed as the optimum establishment would be swift initial establishment and then submitting to the native ecotypes. Personal communication with Dr. Ray Brown indicated, from his fourteen years of experience with these species in alpine reclamation in the Beartooth Plateau, Montana, that the *Deschampsia caespitosa* establishes well in the first three years and then tends to yield to native associations and is often totally regressed after 10 years. As this is an ideal attribute the *D. caespitosa* forms the highest percentage of our seed.

Methodology

Rehabilitation in the three contracts essentially involved five basic procedures: pre-planning; site preparation; transplanting of native sods; seeding; and masking.

Pre-planning

Revegetation in parks must occur during the accessible, short growing season when visitation is highest. Closing the area to public use and effective pre-planning greatly increase the chance of success of a rehabilitation project. All areas predetermined to receive sod or seed or both were mapped out and the amount of sod available was determined. As not enough sod was available to completely revegetate the disturbed areas at Floe Lake campground, certain areas were prioritized to receive more sod than others.

Two general classifications of vegetation type can be used to describe the sod which was obtained from the construction areas. Vegetation native to the open meadows was designated "meadow sod" -this sod contained a high percentage of Carex species sedges and was replanted in open meadows. Sod obtained from beneath semi-closed forest canopies was designated "forest sod" -this sod contained a high percentage of Cassiope mertensiana and was replanted at similar sites, sod from transition zones contained species from both ecotypes and often a considerable amount of Valeriana sitchensis. Both types of sod contained a large percentage of different wildflower species. All sod was therefore exchanged within the ecotypical boundaries and within similar pH levels. Available sod relative to area of disturbance came to 70% Carex association and 50% Cassiope association.

As there was enough "meadow" sod to revegetate up to 70% of the disturbed meadow areas certain areas were prioritized to receive more than 70% coverage and low priority areas received less. This situation was duplicated with "forest" sod. Prioritization was based on existing use zones, highly visible areas near upgraded use facilities received more sod than less visible areas. Prioritization of revegetation areas formed the basis for revegetation within the newly introduced eating areas. As the eating areas concentrate facilities within a small zone it is unlikely that revegetation will be successful without inhibitory structures to route human traffic away from the peripheral zones. Wherever there are bushes or shrubs in a backcountry campsite there is an evident island of vegetation around that shrub, regardless of size. With this in mind the intensive, communal use zones (eating areas) were revegetated with islands of shrubs and the herbaceous vegetation planted around the shrubs in a natural seeming pattern to channel human traffic into regular routes.

Site Preparation

Site preparation involved the scarification of compacted areas and fertilization of these areas. As many plants find it difficult to establish themselves in compacted soil the growth medium was loosened to a depth of 100mm by spading and ripping. This provides for better aeration and percolation and also allows the fertilizer to be mixed into the soil. Preparation on trails differed only in that the edges of the trails were cut to a 90 degree angle for close matching of the sod. Following scarification the fertilizer mixture was raked in to a depth of 50mm at the required application rate.

Sodding

Areas prepared for sodding were transplanted with native sod cut from construction areas. The sods were cut to a minimum of 100 mm deep and a minimum of 300 sq mm in area. The cut sod was then treated with Wurzil-Dip rooting hormone sprayed directly onto the roots, and then planted into the prepared medium with the surrounding dirt in closepacked affinity with the introduced root mass, this was often accomplished by cutting the sod larger than prepared hole. The sod was planted as soon as possible after removal from the construction areas. Effective preplanning made it possible to plant the sod quickly, usually within the same day. All transplanted areas were watered immediately to a penetration of 100mm, contractor's responsibility for watering extended for four weeks after planting. Watering was ceased early in September when it was determined that plant material had reached a stage in its life cycle which no longer required water (i.e. the onset of winter dormancy).

Seeding

Areas not covered by transplanting were seeded with the native grass seed mixture supplied by the Park. In the two Rockwall Pass contracts this was basically a secondary measure for the loose soil in transplant areas. At Floe Switchbacks the entire **campsite was seeded** with the Agropyron mixture, no sodding took place at this campsite. Seeding at Floe Lake took place on barren areas amongst the transplants at a rate of 0.7 kgs/100sq meters. The three species mixture was used, due to the grasses respective tolerance for shade a higher percentage of *D. caespitosa* was seeded in the shaded areas and a higher percentage of *P. alpina* in the meadows. The seed was planted at a minimum depth of less than 7mm, using wire rakes half the seed was sown in one direction and half at right angles. The soil was then packed lightly with steel rakes.

Seeding was basically a compromise situation. Not enough native sod was available for complete sodding of the disturbed areas and there is no commercially available seed which is common on the ecosites. Other than a small percentage of *Poa alpina* (0.5%) the vegetative association is a herbaceous community dominated by sedges, wildflowers and shrubs. This community is virtually exempt at grasses at the ecosites in consideration. The decision to use seed was based primarily on the desire for a complete ground cover as soon as possible which would enhance the visual character of the site and improve the microclimatic characteristics which are required for successful plant establishment.

The decision not to use *Agropyron trachycaulum* at the upper campsite was based on the limited success of *A. trachycaulum* at elevations over 2000 metres. In addition to this *A. trachycaulum* is an erect, tufted bunchgrass ranging from 50 to 100cm in height, this grass would look very out of place in a *Carex* sedge dominated meadow community. There is also the possibility that a tall bunchgrass planted among native sod such as *Carex* or *Cassiope* could shade the periphery of the native community and limit the invasive spread of the native community which, ideally, will crowd out the introduced grasses.

Despite the decision to use this seed for the previously mentioned reasons there is always a danger that such an introduction could alter the successional stage of the plant community and provide the impetus for a shift to a grassland type of community in the future. As competition between native ecotypes and introduced species differs from area to area the revegetation areas must be carefully monitored over the next decade to determine invasive and competitive characteristics.

Screening

Screening was employed, where practical, to hinder traffic through rehabilitation areas. Permanent screening utilizes natural material such as logs, rocks and deadfall. Where permanent screening was too "evident" to the natural scenery, temporary screening using signs and ribbons was applied.

Monitoring

A monitoring plan for the revegetation work completed this season has been established. A photographic record system has been implemented to compare future impacts, over a minimum five year period, to this baseline study. Panoramic photostations have been set up on the three contract areas, 6 on the Limestone section, 5 on Wolverine and 10 at Floe Lake. These panoramic photos provide information on disturbance prior to the rehabilitation/upgrading and afterward. They will be used to provide a baseline comparison to future impacts and record of species abundance and invasion, or impact caused recession.

The revegetation areas at Floe Lake are subject to consideration as to the success of the project. There is also some question as to whether the introduced species will function as desired. For this determination a monitoring system based on percentage ground cover and species composition has been implemented. Three rehabilitation areas representative of the three main vegetation types now maintain a stratified random sampling system set up for long term monitoring using the 35mm slide method. This method is an accurate means of determining the aerial cover of herbaceous vegetation.

The sample quadrats are determined from a baseline and a 750x1000mm quadrat is photographed vertically, each plot contains five photoquadrats. These color slides are then projected over a grid of 100 squares to calculate percent cover. The percent cover and species composition can then be used as baseline data to compare against future replicate photographs. This is a long-term monitoring plan which will be utilized for up to the next ten years.

APPENDIX 3
MONITORING TRAIL USAGE

MONITORING TRAIL USAGE
WITH TRAIL COUNTER MODEL 600
Prepared by Tim Van Egmond
Wilderness Technician

The trail counter used on the Valleyview Trail performed well according to specifications. There was no major problem and statistics are accurately recorded by this method. Small problems involved a shorter battery life than expected. This required a removal of the battery every three weeks rather than four. The availability of an extra battery would result in smoother utilization of this device as when one battery is removed the other could be immediately put in its place resulting in less count loss and less time involved in disguising the site.

Despite the fact that the battery box was encased in a plastic bag, the frequent removal of the battery resulted in dirt getting into the bolt holes of the plastic battery box causing threads to strip. In the event of further use of this type of system, I would advise that the battery box be encased in a wooden box slightly larger than itself. This will prevent soil from entering the container.

APPENDIX 4

PHOTOGRAPHS

Subject: Rockwall Pass Project-Limestone Section 42
Date: July 28/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 8.12
Remarks: **BEFORE.** Photo taken during contract inspections. Trail leaves a larch meadow to travel up a 15-25% slope. The trail is a spring runoff route and all the braids are muddy and difficult to walk on due to the concave tread surface. The snow has just come off this slope and the vegetation is slightly flattened from the weight. Note both trails and the mud in the foreground. See accompanying photo below.

Subject: Rockwall Pass Project-Limestone Section 45
Date: August 20/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 8.12
Remarks: **AFTER.** The revegetated area and new tread surface. The rocks at the side of the trail are to provide protection for the rehabilitated areas. The logs in the upper right corner are water bars waiting to be installed.

Subject: Rockwall Pass Project-Limestone Section 47
Date: August 10/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 9.20
Remarks: **BEFORE.** Lower end of wet meadow, notice the muddy multiple trails on the 10-15% slope. This area remains muddy and wet throughout the hiking season. The trail was rerouted around this problem section. See accompanying photo below.

Subject: Rockwall Pass Project-Limestone Section 48
Date: August 28/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 9.20
Remarks: **AFTER.** This photo was taken after the work on this section was completed, the trail braids and main trail have been revegetated and masked to stop further use. The reroute (from the Helmet side) begins here, the freshly prepared tread surface leads off to the right and continues on a gentle grade with one switchback to join up with the trail over a kilometre away.



OVERVIEW OF SITE



VIEW OF STREAM BED



VIEW OF STREAM BED



Subject: Rockwall Pass Project-Limestone Section 38
Date: July 28/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 7.62
Remarks: **BEFORE.** Taken from Photostation #2 before contract work began. The trail leaves a larch meadow and enters a subalpine forest canopy. This is an extremely muddy trail section and is frequently a runoff path in early season. See accompanying photo below.

Subject: Rockwall Pass Project-Limestone Section 41
Date: August 20/86
Photographer: T. Van Egmond
Remarks: **AFTER.** This photo was taken from Photostation #2 after completion of this section of trail. The trail was drained above to run the water off to the right where a slope drained to the creek. The new gravel tread surface was established and the impacted trail-side was revegetated.

Subject: Rockwall Pass Project-Limestone Section 43
Date: July 28/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 8.17
Remarks: **BEFORE.** Photo was taken from Photostation #3. The trail is climbing a 15-25% slope. Problems with erosion are evidenced by the concave, narrow tread surface. Uncomfortable for walking a second trail has started beside it. See accompanying photo below.

Subject: Rockwall Pass Project-Limestone Section 44
Date: August 20/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 8.17
Remarks: **AFTER.** Taken from Photostation #3 during work on this section of trail. The tread surface has been widened for comfortable walking and transplanting of the trail braid is in process. Often, as in this case, part of the disturbance can be included and covered by the upgrading work leaving less to be rehabilitated and therefore less vegetation required.

Subject: Rockwall Pass Project-Limestone Section 34

Date: July 28/86

Photographer: T. Van Egmond

Location: Rockwall Trail, kilometre 7.624

Remarks: **BEFORE.** Photo taken from Photostation #2 before start of contract work. The trail leaves the forest canopy to enter a larch meadow. At this point an excessively muddy area is encountered resulting from a spring above and to the right of the trail. See accompanying photo below.

Subject: Rockwall Pass Project-Limestone Section 37

Date: August 20/86

Photographer: T. Van Egmond

Remarks: **AFTER.** Photo taken from Photostation #2 during the contract work. The eroded, chewed-up trailside has been revegetated. The muddy trail section has been dug out and a Mirafi blanket laid down, this was then filled with coarse pitrun from the gravel site. This area, not quite finished, has been wrapped and is in the process of being graveled. The purpose of the Mirafi is to provide the water with an escape route below the trail, as the spring is on the right-hand side of the trail and the creek is on the left-hand side of the trail the Mirafi drain will allow the water to move to the creek underneath the trail while the gravel maintains a well-drained tread surface.

Subject: Rockwall Pass Project-Limestone Section 39

Date: July 28/86

Photographer: T. Van Egmond

Location: Rockwall Trail, kilometre 7.40

Remarks: **BEFORE.** As the trail climbs to enter the forest canopy from a subalpine meadow excessive braiding and a deeply eroded trail surface are evident. The major eroded trail is to the right and braiding is seen to the left. Note the exposed rocks and tree roots on the main trail. See accompanying photo below.

Subject: Rockwall Pass Project

40

Date: August 24/86

Photographer: T. Van Egmond

Location: Rockwall Trail, kilometre 7.40

Remarks: **AFTER.** A close-up photo of the rehabilitation work with the rebuilt tread surface to the right. Revegetated with a Carex species/Valeriana sitchensis vegetation complex the braids are invisible are reclaimed to virtually original undisturbed status. The new tread surface is well-drained by water bars and is a hikers dream.





Subject: Rockwall Pass Project-Wolverine Section 30
Date: August 5/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 3.70
Remarks: **BEFORE.** Taken from Photostation #1 before work began. This hummocky meadow is where the new reroute will cross to the base of the scree slope. Note pegs in the photo. See accompanying photo below.

Subject: Rockwall Pass Project-Wolverine Section 33
Date: August 27/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 3.70
Remarks: **AFTER.** Taken from Photostation #1 after completion of contract work. As this is a moist meadow the trail is finished with gravel. Note the revegetated in the left foreground of the photo.

Subject: Rockwall Pass Project-Wolverine Section 35
Date: August 5/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 3.20
Remarks: **BEFORE.** Photo taken from Photostation #4 before contract work began. This is a wet, muddy section of trail approaching the wide multiple stream crossing area. See accompanying photo below.

Subject: Rockwall Pass Project-Wolverine Section 36
Date: August 19/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 3.20
Remarks: **AFTER.** Note revegetated trail in the foreground and scarified trail in the in the middle of the photo. All sod for revegetation was obtained from construction areas, because there was not enough sod to complete this section it was scarified, seeded and fertilized. Since this is a very wet area vegetation establishment and invasion should take place quickly resulting in complete natural regeneration in 3-5 growing seasons. It would take 2-3 times that long without scarification and fertilizer and would take much longer in a dry area.

Subject: Rockwall Pass Project-Wolverine Section 26
Date: August 5/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 3.49
Remarks: **BEFORE.** Taken at Photostation #2, facing the marshy meadow. Note the clearly defined, narrow trail visible as it disappears into the trees across the meadow. See accompanying photo below.

Subject: Rockwall Pass Project-Wolverine Section 29
Date: August 19/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 3.49
Remarks: **AFTER.** The revegetated trail has virtually disappeared across the entire meadow. While the trail can still be followed by someone familiar with the vegetation patterns this trail will have disappeared totally within two growing seasons.

Subject: Rockwall Pass Project-Wolverine Section 31
Date: August/86
Photographer: K. Baines
Location: Proposed trail route in Wolverine section, approximately kilometre 3.50, Wolverine Pass in background of photo.
Remarks: **BEFORE.** This is the base of the scree slope which the trail will cross in the reroute around the meadow. As there is a complete lack of vegetation this will be a minimal impact trail. See accompanying photo below.

Subject: Rockwall Pass Project-Wolverine Section 32
Date: August/86
Photographer: K. Baines
Location: **AFTER.** New trail across scree slope pictured above, approximate location is 3.40 kilometres.
Remarks: Completed trail, note the use of ditching and drainage to allow the continually melting snowpack to drain while keeping the trail dry.



010000000000
010000000000





Subject: Rockwall Pass Project-Wolverine Section 22
Date: August 5/86
Photographer: T. Van Egmond
Location: BEFORE. Rockwall Trail, kilometre 3.20
Remarks: Photo taken at photostation #4. Trail leaves meadow and winds up a 10-15% grade to an alpine fir patch. This section of trail is roughly 100 metres in length and is severely compacted. The meadow to the upper, left side of the trail is often 10-20 centimetres above the tread surface. See accompanying photo below.

Subject: Rockwall Pass Project-Wolverine Section 25
Date: August 19/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 3.20
Remarks: AFTER. Photo taken from Photostation #4 after revegetation was finished on this section of trail. An excellent example of revegetation work. Take note of the sod transplants which match closely to the contour of the original slope, each transplant is wedged tightly into the original prepared trail surface. Complete sodding of trails such as these effectively eliminates erosion and usage by people who are curious as to where the original trail went. Already invisible from a short distance away this trail will be hidden to trained eye in the next growing season.

Subject: Rockwall Pass Project-Wolverine Section 27
Date: August 5/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 3.49
Remarks: BEFORE. Taken from Photostation #2 before initiation of contract work. This photo is on the north side of a large meadow whereas the first set of photos was on the south side. The flat portion of this meadow was a network of creeks 1 metre to 3 metres wide. The trail was therefore rerouted around this mudhole. See accompanying photo below.

Subject: Rockwall Pass Project-Wolverine Section 28
Date: August 5/86
Photographer: T. Van Egmond
Location: Rockwall Trail, kilometre 3.49
Remarks: AFTER. Photo taken from Photostation #2 during contract work. Note finished work in the foreground and work nearing completion in the gully and background of the photo.

Subject: Floe Lake Project 18
Date: Sept. 5/86
Photographer: K. Baines
Remarks: New campsites at Floe Lake, these tent pads are located to ensure maximum privacy while still being concentrated in small meadows. The tentpad in the foreground is one of eight located in a meadow approximately 100 metres above the eating area in old campsite 12c, the trail leads to two other tentpads one to the immediate right and one behind the trees in the background. The tentpads are gravelled with the same material as the trails, this gravel, obtained from the glacial moraine, is the only practical material available to provide for a dry tentsite. Note the rounded corners on the trails to the tentpads.

Subject: Floe Lake Project 21
Date: Sept. 5/86
Photographer: K. Baines
Location: Campsite 12e
Remarks: Upgraded to a two tentsite campsite this camp is located on a sheltered knoll above the lakeshore. While the perimeter will localize the impacts the wooden bar in the center is to assure that the site is used for two tents and not one. Pictured in the photo are Wilderness Recreation Specialist George Sranko and Warden Diane Volkers talking to a hiker about to set up camp.

Subject: Floe Lake Project 23
Date: Sept 5/86
Photographer: K. Baines
Location: Main trail through campsite, revegetated area at left is old campsite 12d.
Remarks: Sections of trail which cannot be properly drained are gravelled. This is one such section of trail, located in a "valley" water from the slopes on each side has no where to go, often resulting in a muddy trail. Gravelled trails provide a firm base for walking and keep travellers off the vegetation.

Subject: Floe Lake Project 24
Date: Sept. 5/86
Photographer: K. Baines
Location: Campsite 12c
Remarks: Tables of eating area are arranged in a pleasing manner following the contour of the natural landscape. Structures like this should be located where they fit in to the natural landscape, orderly symmetrical patterns should be avoided as they look out of place in nature.





Subject: Floe Lake Project 17
Date: Sept. 5/86
Photographer: K. Baines
Location: Campsite 12b
Remarks: This is the revegetated campsite which is closed to further use. Compare this photo to previous black & white photos taken from photostation #2. Note the improved contour and the patchwork revegetation system. The revegetation program at Floe Lake is one of few utilizing a combination of seeding and transplanting to revegetate a disturbance. This area is a monitored quadrat, one of three areas at Floe Lake utilizing a system of photoquadrats to determine the success of such a revegetation project.

Subject: Floe Lake Project 17
Date: Sept. 5/86
Photographer: K. Baines
Location: Campsite 12c
Remarks: This campsite was upgraded into an eating area. The table here provides the backcountry traveller with a comfortable utility to enjoy supper on. The use of tables in the backcountry is somewhat controversial but is necessary to localize impacts and to delineate eating areas. The separation of eating and sleeping areas is important in minimizing problem encounters between campers and wildlife. The bordered perimeter will concentrate the impacts on the table sites.

Subject: Floe Lake Project 19
Date: July 30/85
Photographer: T. Van Egmond
Location: Hill between Warden Patrol Cabin and trail junction to Numa Pass.
Remarks: **BEFORE.** Highly impacted area under a light forest canopy. Vegetation damage is 100% and the soil compaction is evidenced by the exposed tree roots. The rocks placed in the photo show the actual location of the trail, several highly used trails branch off from this area. See accompanying photo below.

Subject: Floe Lake Project 20
Date: Sept 5/86
Photographer: K. Baines
Location: Hill between Warden Patrol Cabin and trail junction to Numa Pass.
Location: **AFTER.** Revegetated area, this photo, taken from a different angle is paired with the above photograph. Note that the tree roots have been covered with soil and transplants occur scattered throughout the periphery. This was declared a high priority area and was revegetated to 60% coverage of vegetation. The trail which used to wind through this area now follows the natural route to the left.

Subject: Floe Lake Project 13
Date: July 29/86
Photographer: T. Van Egmond
Location: 12d
Remarks: **BEFORE.** Photo taken at Photostation #10 before contract work began. Vegetation damage and soil compaction is evident. Room for 3 tents, the original tentpad spread out until it covered a roughly circular area bordered by the slopes enclosing the meadow. Take note of the charred wood near the center of the barren area. See accompanying photo below.

Subject: Floe Lake Project 14
Date: Sept 13/86
Photographer: T. Van Egmond
Location: Campsite 12d
Remarks: **AFTER.** Photo taken at photostation #10 one week after construction work was finished. This campsite was directly beside the main trail, because of it's close proximity to the trail and the obvious impact it was rehabilitated. Note the heavier concentration of sod closer to the trail. The ashes and soil surrounding previous firepits was dug out and removed. The area was then scarified, fertilized and revegetated with sod obtained from the construction areas. Note in the upper left corner the graveled trail which was frequently muddy in the early season.

Subject: Floe Lake Project 15
Date: Sept 6/86
Photographer: R. Hawryluk
Location: Rehabilitated campsites 12a and 12b
Remarks: This photo was taken the day after the work was completed. The Backcountry Warden arrived on this scene one morning when he rode into the campground. Two of the tents are pitched exactly on top of the rehabilitation areas and one is pitched on the undisturbed meadow. In the lower left corner of the photo someone has hung a jacket over the campsite sign. This sign displayed a detailed map of the campsite explaining what was happening at the campsite, where the facilities were located and a request for people not to trample the revegetated areas. This clearly exhibits the need for backcountry wardens to enforce proper use of the campsites for success of these projects. Areas which are closed during the summer for such work should remain closed for the remainder of the season and for the early portion of the next season to enhance the establishment of a vegetative cover without disturbance.

Subject: Floe Lake Project 16
Date: Sept 3/86
Photographer: K. Baines
Location: Rehabilitated/Upgraded campsite 12f
Remarks: This photo shows the location and setting of the eating area which was originally a severely impacted site, note the vegetative cover, the individual trails to each table and the islands of small trees to impede random trampling and enhance vegetation establishment.





Subject: Floe Lake Project 9
Date: July 29/86
Photographer: T. Van Egmond
Location: Campsite 12c
Remarks: **BEFORE.** Taken from photostation #3 prior to construction work. A portion of campsite is shown, it is undeveloped with large compacted areas. Bare soil is evident in a large segment of the photo. Another compacted area appears in the left background and three communal trails in the right backdrop of the picture. Soil compaction is evidenced by the sharp line of vegetation in the left of the photograph. See accompanying photo below.

Subject: Floe Lake Project 10
Date: Sept 13/86
Photographer: T. Van Egmond
Location: Campsite 12c
Remarks: **AFTER.** Photo taken at photostation #3 one week after all work was completed. This area was upgrade into an eating area. The original contour was restored and the disturbed matrix was revegetated with native plant ecotypes, the transplanted vegetation in the foreground is primarily composed of Carex sedges. Note in the background the upgrading of one of the access trails, the other two communal/access trails were revegetated and masked.

Subject: Floe Lake Project 11
Date: July 29/86
Photographer: T. Van Egmond
Location: Campsite 12f
Remarks: **BEFORE.** Photo taken at Photostation #9 prior to start of project. This campsite is located immediately off the lakeshore in a protected cove. Vegetation damage and soil compaction are evident throughout the entire campsite of which only a portion is shown in this photo. This campsite received a rating of highest impact in the entire campground. Note the ashes from a fire on one of the large rocks causing additional problems to vegetation establishment. Impact is spread out through the entire area (note the barren tree roots), only the vegetation in the foreground, the entrance to this site, is still surviving. See accompany photo below.

Subject: Floe Lake Project 12
Date: July 29/86
Photographer: T. Van Egmond
Location: Campsite 12g
Remarks: **AFTER.** Photo taken at photostation #9 after completion of work. This area due to scenic views of the lake and excellent access to water was upgraded to an eating area. 4 tables were installed, each with a particular trail leading to it. While communal trampling is inevitable the vegetation transplanted to the area utilized shrubs, young trees and rocks in an attempt to channel the traffic and still keep things looking natural.

Subject: Floe Lake Project 5
Date: July 29/86
Photographer: T. Van Egmond
Location: Campsite 12b
Remarks: **Before.** A closeup photo of campsite 12b taken from photostation #2. The barren core of this campsite extends beneath the trees and many roots have become denuded of soil cover. Extreme soil compaction is evident by the higher mound of earth surrounding the campsite sign, note also the slumping bank above the compacted earth. See accompanying photo below.

Subject: Floe Lake Project 6
Date: Sept 13/86
Photographer: T. Van Egmond
Location: Campsite 12b
Remarks: **AFTER.** Photostation #2, closeup photo of campsite 12b after rehabilitation work was completed. The original contour of the site was reestablished and the tree roots covered with soil, the area was transplanted using both "meadow sod" and "forest sod" in their respective areas.

Subject: Floe Lake Project 7
Date: July 29/86
Photographer: T. Van Egmond
Location: Campsite 12a and 12b
Remarks: **BEFORE.** Photo taken at Photostation #1 prior to start of work. Note the deeply cut tentpads on each site and the damaged vegetation surrounding the barren core. The main trail, which is very wide due to peripheral trampling, cuts through each campsite very close to the barren tentsites. This is an open scenic meadow and therefore both campsites were closed for rehabilitation. See accompanying photo below.

Subject: Floe Lake Project 8
Date: Sept 13/86
Photographer: T. Van Egmond
Location: Campsite 12a and 12b
Remarks: **AFTER.** Taken from photostation #1. These campsites were located in a scenic meadow offering views to the lakeshore, they were moderately to heavily impacted and were very close to the main trail. Both campsites were rehabilitated. The contour was restored, the main trail slimmed down and both sites planted with natural vegetation. The "tent sites" sign at the trail junction is a temporary measure which will be removed when permanent signs are installed at the campsite.





Subject: Floe Lake Project 1
Date: July 29/86
Photographer: T. Van Egmond
Location: Campsite 12g
Remarks: **BEFORE.** Photo taken at photostation #8 before contract work began. An undeveloped campsite with room for up to 4 tents. There are three trails leading to this campsite (only one is visible). There is a barren core in the tentsite area which has a runoff washout eroding through the center of it. This tentsite is in plain view of the main trail. See accompanying photo below.

Subject: Floe Lake Project 2
Date: Sept 13/86
Photographer: T. Van Egmond
Location: Campsite 12g
Remarks: **AFTER.** Photo taken at photostation #8 one week after all work was completed. Campsite was upgraded to 2 tent pads (portion of one seen in right of photo). The previously disturbed barren core was revegetated with "meadow sod" and the tent pads placed away from the runoff zone and the main trail. Two access trails were upgraded and one, with two communal trails, was closed and rehabilitated

Subject: Floe Lake Project 3
Date: July 29/86
Photographer: T. Van Egmond
Location: Campsite 12c
Remarks: **BEFORE.** Photo taken at photostation #3 before contract work began. A campsite with room for 4-5 tents, no development of any type. Note the severe vegetation damage and soil compaction which has spread throughout the periphery. Mud in the foreground of the photo shows the early season conditions of the campsite which recur with each rainstorm. There are several short access trails to this campsite, only one is really necessary. See accompanying photo below.

Subject: Floe Lake Project 4
Date: Sept 13/86
Photographer: T. Van Egmond
Location: Campsite 12c
Remarks: **AFTER.** Photo taken at photostation #3 one week after all work has been completed. This campsite has been upgraded to an eating area with four tables. The compacted periphery was scarified and revegetated by seeding and transplanting *Carex* species. Note in the background the two additional access trails which have been revegetated and masked with deadfall, this eating area now has two access trails, one from the campsite above and one from the main trail/lakeshore access.