A DEVELOPMENT PLAN FOR CROSS-COUNTRY SKIING ON THE WASHINGTON PLATEAU

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28 March 1980

SUMMARY

Directed to future developers, this report presents a detailed approach to development of a cross-country ski area on the Washington Plateau, Vancouver Island.

The cross-country ski trail development plan I have advocated consists of 17 kilometers of ski trails with construction costs estimated at $8,600.00.

The cross-country ski market in western Canada is virtually untapped. I recommend the developers of Mt. Washington Ski Resort take advantage of this undiscovered market by integrating cross-country skiing into their total resort plan.

Plate i: Cross-Country Skiing on the Washington Plateau

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Introduction

The purpose of this report is to provide the developers of Mt. Washington Ski Resort with a plan for development of a cross-country ski facility in the Washington Plateau area. This report completes partial requirements of the Wildland Recreation Technology program at Selkirk College.

Since the downhill ski area at Mt. Washington is at the developing stage, it makes sense now to incorporate andintegrate a cross-country ski trail system into the total resort plan. Traditionally, downhill ski industry people have felt that cross-country skiers can contribute little in the way of revenue. However, this view is probably incorrect: the ability to generate revenue from the cross-country skiing market is a function of planning.

While working for the Mt. Washington Ski Resort during the summer of 1979, I was assigned an area for cross-country ski trail development by Peter Gibson, the Mt. Washington Ski Director, and proceeded from there. I have found that many factors are to be considered in planning and constructing cross-country ski trails and have approached this report as a complete planning package.

The Mt. Washington Ski Resort

Mt. Washington Ski Resort is located 31 kilometers northwest of Courtenay, Vancouver Island, B.C. (Figure 1). It can be reached by a government maintained highway for much of the way, then by area-maintained access. There is also a bus service to Mt. Washington from Courtenay.

The ski resort became an instant success in its opening season - winter of 1979 - 1980. At present, the area has two double chairlifts, a beginner tow and offers 490 vertical meters of skiing. There is a daylodge, a cafeteria, a lounge, ski rentals and equipment, sales and service, a ski patrol system and a professional ski school. Five additional chairlifts are planned for installation over the next several years. Approximately 250 hectares of the resort is set aside for the development of a ski village. (Appendix A).

Figure 1

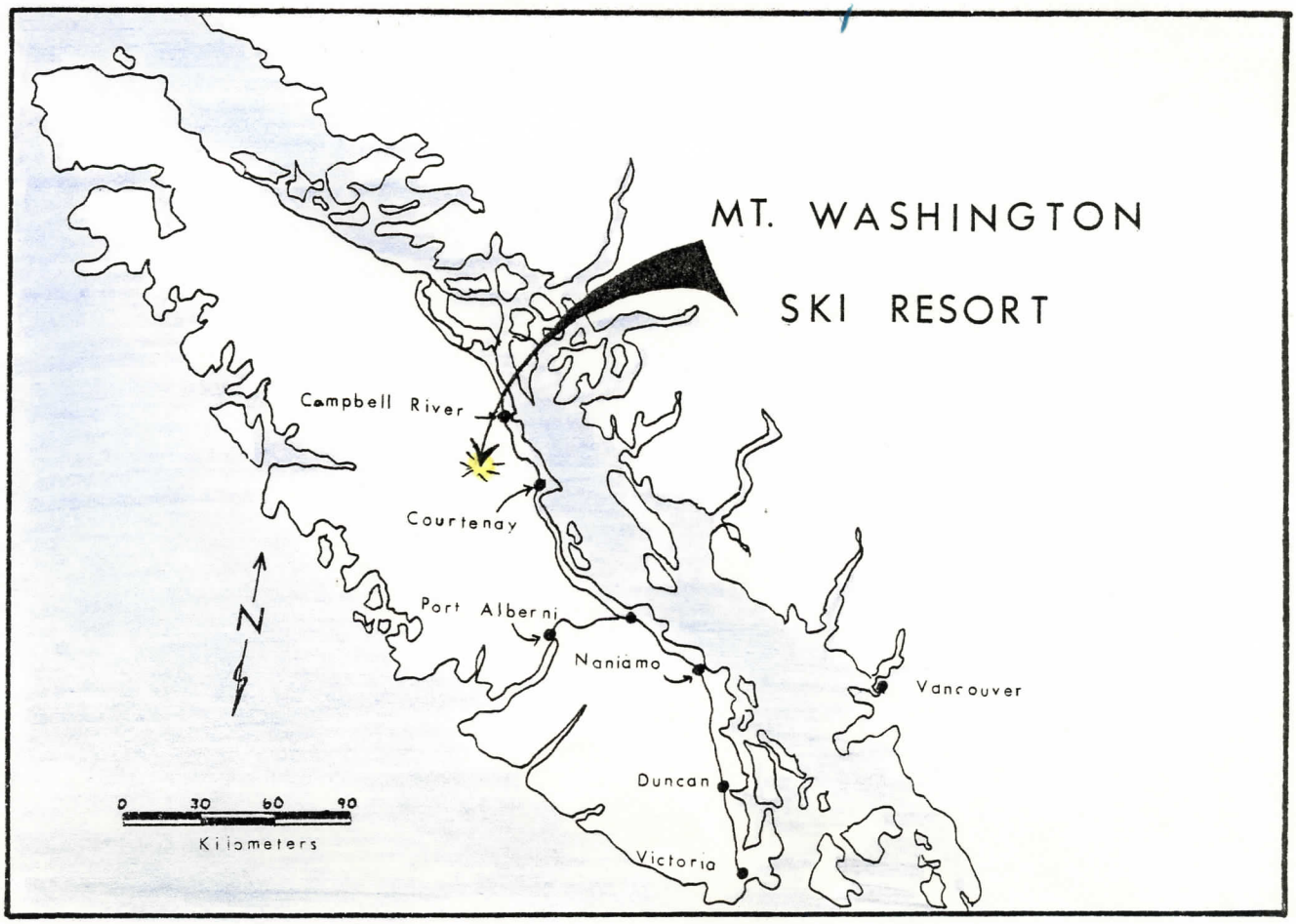


Plate 1: Mt. Washington

The ski area has exceptional snowfall for Vancouver Island; the ski season begins in late November and goes through to April. The major population centres are Campbell River, Courtenay, Naniamo, Port Alberni, Duncan and Victoria (figure 1). The following chart depicts the distances from these major population centres to the ski resort.

Figure 2: Distances from Mt. Washington Ski Resort

Campbell River .....69 km

Courtenay.....27 km

Naniamo. .....136 km

Port Alberni.....132 km

Duncan.....189 km

Victoria.....245 km

Demand for Cross-Country Ski Trails on the Washington Plateau

It is reasonable to anticipate a substantial demand for cross-country skiing in this area as well as downhill skiing.

Figure 3 illustrates that approximately 16% more households in Quebec own cross-country skis than in B.C.. Sales of cross-country skis in western Canada are slow in comparison to the boom of cross-country ski sales in eastern Canada. One reason for this is that cross-country ski trail development is far slower in the west than in the east. One Vancouver equipment supplier asked, "How can you sell cross-country ski equipment when there is no place to use it?"

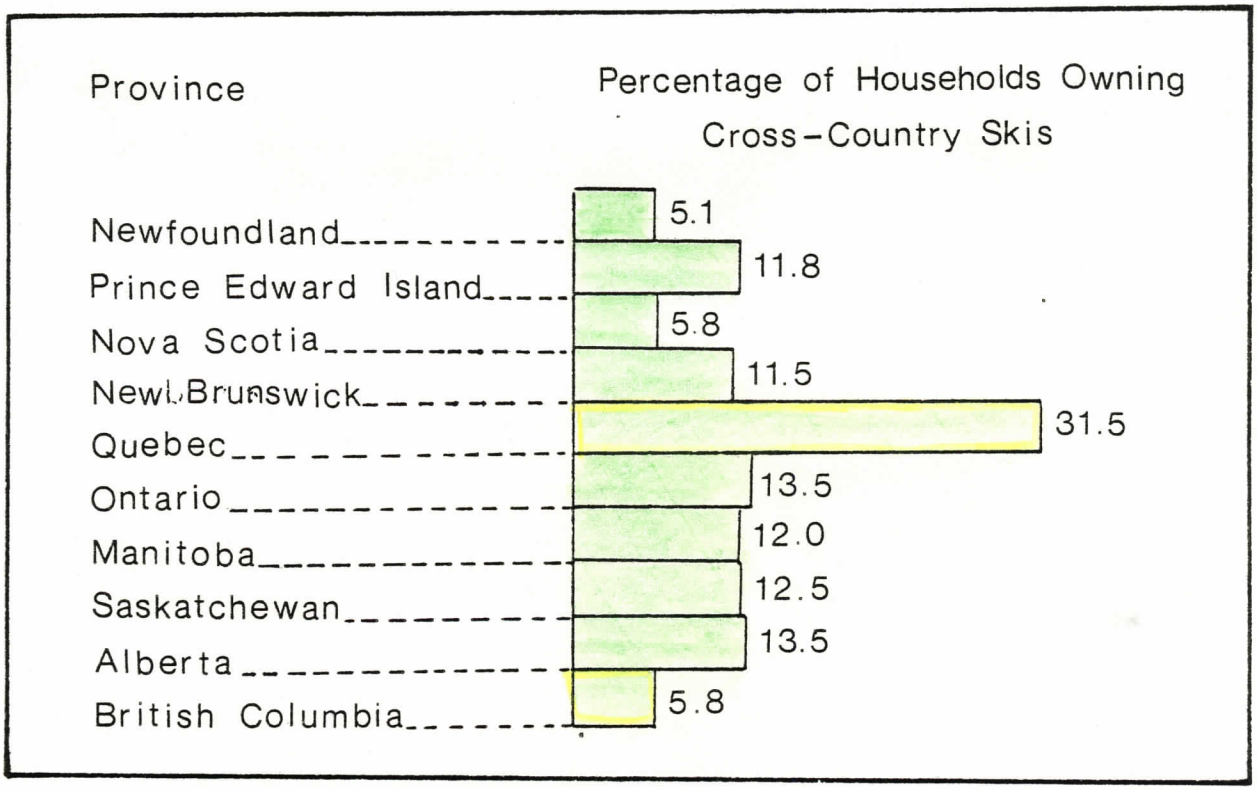


Figure 3

One may ask, "Why build a cross-country ski trail when skiers can go anywhere they want, providing there is adequate snow cover?" The answer to this is, while wilderness ski touring and "bushwhacking" may con-

tinue to be an active aspect of the sport, a well designed, marked and maintained ski trail will provide what may well be the most satisfying experience for the majority of cross-country skiers in the Mt. Washington area. The reasons for this are: a) the novice cross-country skier will learn faster and feel safer on a developed trail system; b) only on groomed tracks can one attain the utmost in cross-country syle and technique; c) a well laid out trail network provides the option of sponsering competitions (appendix B); and d) track skiers on Vancouver Island do not have such a facility at their backdoor.

The demand for cross-country ski trail development is justified by an increase in sales and rentals of local cross-country ski shops. Many people are making use of the present cross-country ski development on the Paradise Meadows just south of Mt. Washington. The number of vehicles in the parking lot adjacent to the Paradise Meadows, which is maintained by the Mt. Washington Ski Resort, reflects the high interest and level of participation of cross-country skiers in the area. (Appendix C).

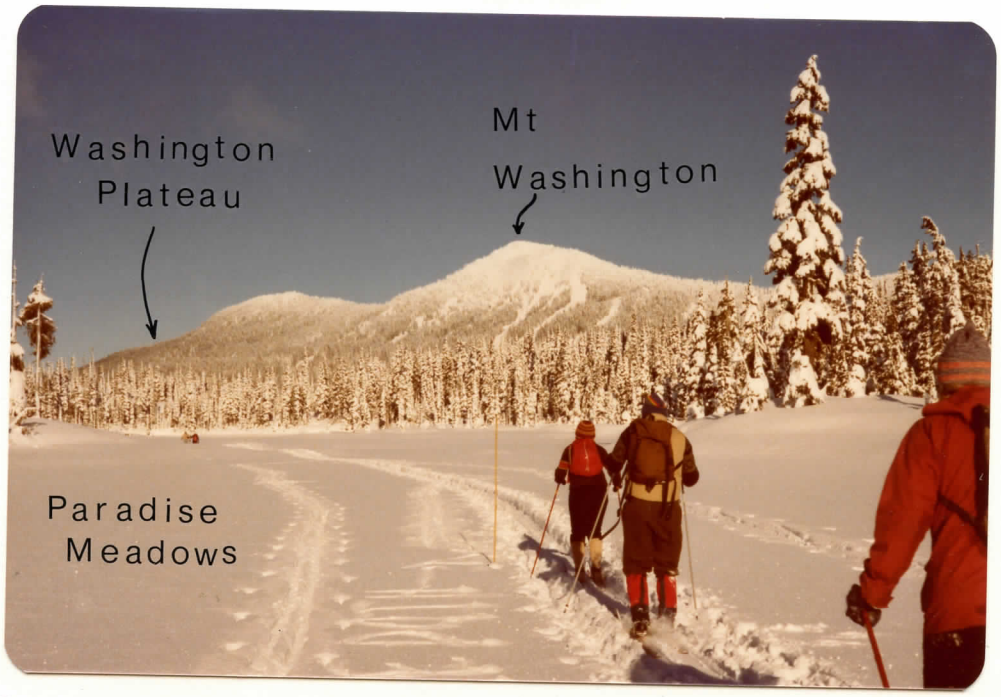


Plate 2: Washington Plateau and Mt. Washington as seen from the Paradise Meadows.

The Paradise Meadows Cross-Country Ski Trail System developed by the Vancouver Island Nordic Ski Club offers excellent trails for the beginner skier. Beginner trails will always be used because there will always be new skiers taking up the sport. However, most people transcend the beginner stage quickly and will want more challenging ski trails. [1]

Ray Peterson [1] suggests the following market potential for cross-country ski trail design: beginner 25%, intermediate 60%, advanced 15%. The Washington Plateau has outstanding potential for intermediate and advanced skiers as well as for the beginner.

[1] This trend was confirmed by discussion with Ray Peterson, B.C. President of the Canadian Association of Nordic Ski Instructors. Peterson, who is also a Level IV C.A.N.S.I. instructor, held a Cross-Country Ski Trail Construction and Maintenance Workshop at Selkirk College on February 21,22, 1980 , which I had attended. Peterson has been actively involved in the cross-country development adjacent to Cypress Park, Vancouver Region, B.C..

Methodology

The following criteria, which I have applied to the development of my proposed cross-country ski trail plan, were developed by the Alberta Recreation and Parks Branch (appendix D) and are sumarized below:

1) Site Planning
   a) Site Selection
   b) Trail Route Selection
   c) Site Inspection
   d) Trail Layout
2) Basic Trail Standards
   a) Trail Length
   b) Trail Grades
3) Trail Construction
   a) Basic Tools
   b) Trail Crews
   c) Trail Clearing Techniques
   d) Clearing Height
4) Operations and Maintenance
   a) Fall Maintenance
   b) Signing
   c) Track Setting

As mentioned earlier, I had been assigned the Washington Plateau as the area for cross-country ski trail layout by the developers of Mt. Washington Ski Resort. One of the first steps in site selection is to anticipate potential future land uses of the desired area. Potential future land uses to anticipate on the Washington Plateau area include logging and downhill ski area expansion.

On the slope leading up to the Washington Plateau, logging is presently underway by the Crown Zellerbach Logging Company. Since this is the access route to the Washington Plateau Cross-Country Ski Area, logging has created clearings which facilitate trail construction as well as create vistas. The draw-back to having these slopes logged is that the soil stabilizing effect of the trees would be lost. This can be remedied by implementing proper clearing techniques and installing waterbars, frenchdrains, drywell, etc., where necessary. (Appendix E).

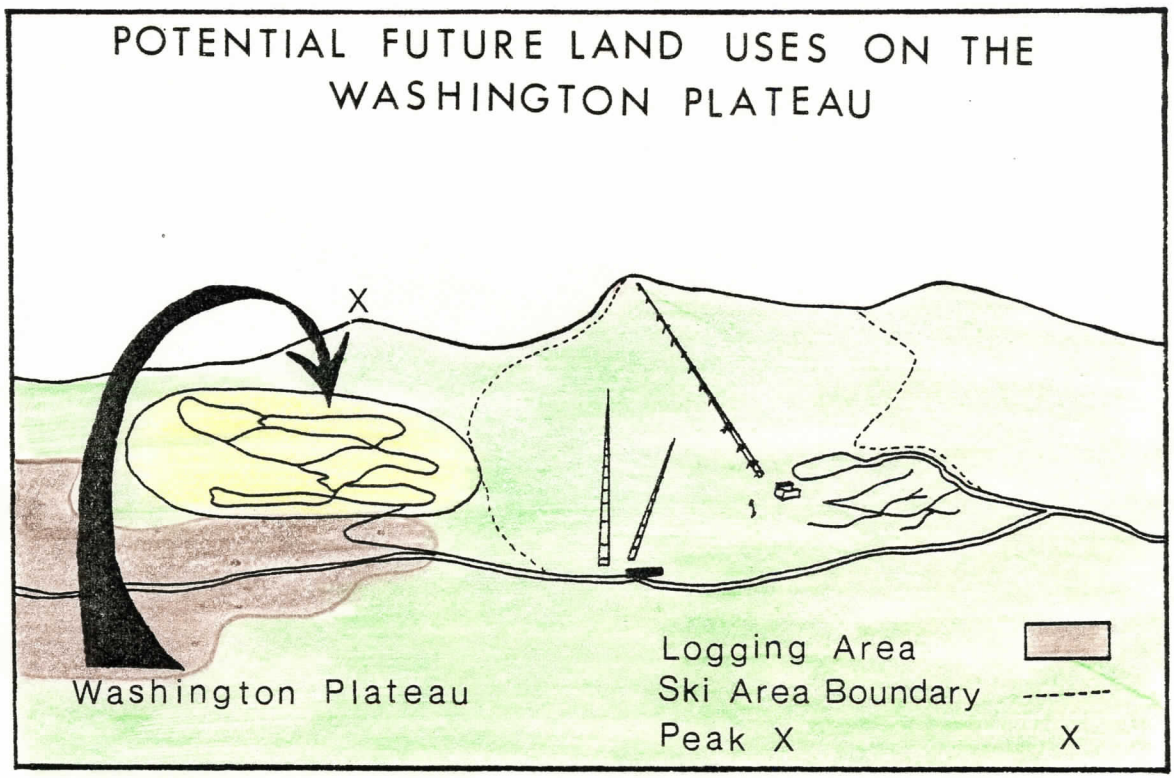


Figure 4

The Washington Plateau itself does not yield a highly productive forest and much of its landbase is unforested. Therefore, I do not antic-

ipate timber harvest to take place on the area where I have located the majority of the cross-country ski trails. I believe the public relation gains the Crown Zellerbach Logging Company would receive from supporting the development of a cross-country ski area would outweigh the value of the timber if logged.

Another possible future land use of the Washington Plateau is the expansion of the adjacent downhill ski lifts to "Peak X".(Figure 4). Since the two uses are incompatable, they cannot co-exist on the Washington Plateau. However, since the area for cross-country ski trail development was assigned to me, I understand that these points have already been considered by the Mt. Washington Ski Resort developers.

Before applying the planning principles I have previously cited, I examined and investigated the environment of the area to be developed.

Washington Plateau - The Site Physiography

1) Snowfall and Climate

Past studies have confirmed that the Washington Plateau receives adequate snowfall to facilitate approximately five months of cross-country skiing from mid-November to mid-April.[2] The climate is one of cool, short summers and cool, long wet winters.

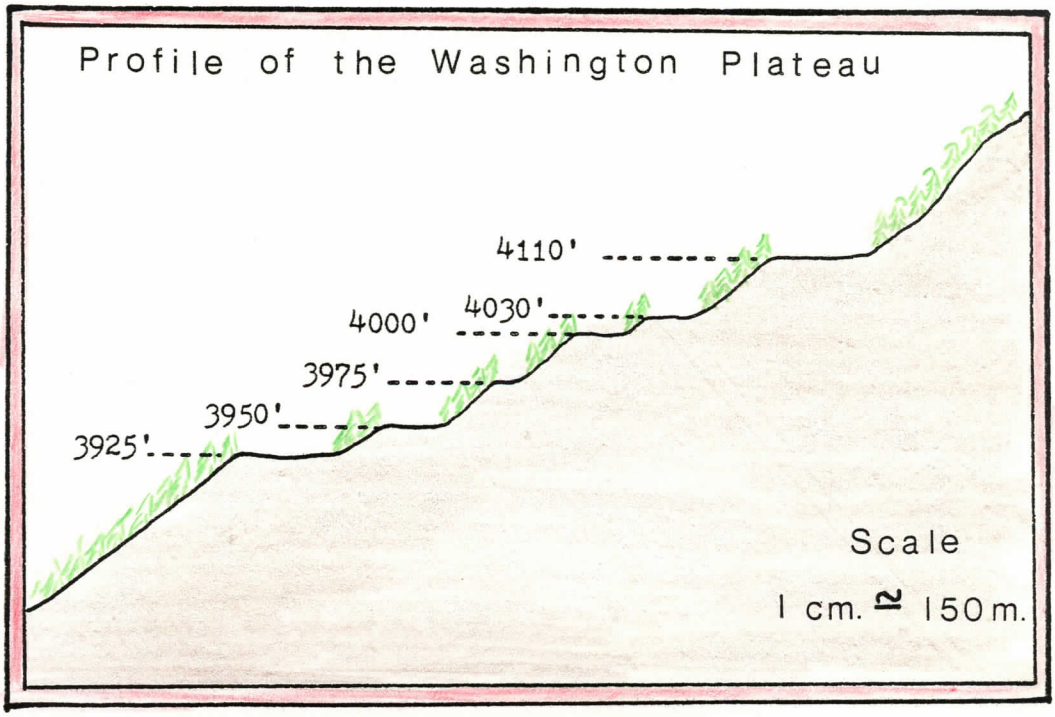
2) Topography

The Washington Plateau consists of five"benches"ranging from 100 metres to 500 metres in width and ranging from 8 kilometres to 2.5 kilometres in length. The "bench" formations of the Washington Plateau are probably the result of variations in resistance to weather and erosion of the underlying bedrock. (Figure 5). The layers of shale, which have

[2] Water Investigations Branch, Water Resource Services, Department of the Environment, Victoria, B.C., Forbidden Plateau Station.

little resistance to weather and erosion, form the benches; the more resistant sandstone layers form the slopes leading up to the benches.

Figure 5



(For profile location, refer to aerial photos, appendix I.)

The terrain on the benches is level to gently rolling, having grade variations of 0% to 15%, which is ideal for cross-country skiing. The terrain connecting the benches consists of slopes ranging in grade from 20% to 50%. These slopes require more effort and attention in cross-country ski trail construction.

3) Soils

My study of the soil on the Washington Plateau indicates it will withstand the compaction and erosion to be expected from the use of this area for cross-country skiing. The benches are more susceptible to compaction as they are poorly drained (plate 3); however, once the soil has become frozen and snow-covered, cross-country skiing would have minimum impact on the soil's condition.

Plate 3: The benches are more susceptible to compaction as they are poorly drained.

The cross-country ski area lies primarily on the Ferro-Humic Podzol landscape.[3] Much of this landscape is subject to continuous seepage. The generally high moisture content and low temperature of the soils

[3] Valentine K., Sprout P., Baker T., Lavkulich L.. The Soil Landscapes of British Columbia, The Resource Analysis Branch, Ministry of the Environment, Victoria, B.C.. 1978.

result in slow decomposition of litter and a relatively high proportion of organic matter in soils. The organic content may reach or even exceed 30%.

Morainal deposits also mantle significant areas on the Washington Plateau. Moraine is composed of fine clays and silt which form a tough hard-pan layer. The hard-pan layer impedes drainage and ponding of water occurs (plate 4). This constraint should not pose a major problem to cross-country ski trail construction as it may be overcome by avoiding the areas where ponding of water does occur and by implementing proper trail construction techniques when these areas are not avoidable. (Appendix E).

Plate 4: The hard-pan layer impedes drainage and ponding of water occurs.

Some of the detrimental effects of trail construction can be avoided if construction takes place in the dry season only. Removal of vegetation increases the potential for erosion; some effort must be made to stabilize the soil after the vegetation is removed. This can be accomplished by laying the mowed bushes on the trail as a mat and by installing waterbars, frenchdrains or culverts where appropriate. At the same time, however, modification of the natural drainage patterns should be kept to a minimum.

4) Vegetation

The most common tree on the Washington Plateau is the mountain hemlock (Tsuga mertensiana); the other major tree species include alpine fir (Abies lasiocarpa), amabilis fir (Abies amabilis), and yellow cedar (Chamaecyparis nootkatensis). Tree growth becomes progressively poorer with elevation due to the shorter growing season, increased duration of snow cover, and cooler temperatures.

The dominant shrubs are the blueberries (Vaccinium alaskaense and V. membranaceum) and false azalea (Menziesia ferruginea).

The Washington Plateau is typical of the Mt. Hemlock biogeoclimatic zone.[4]

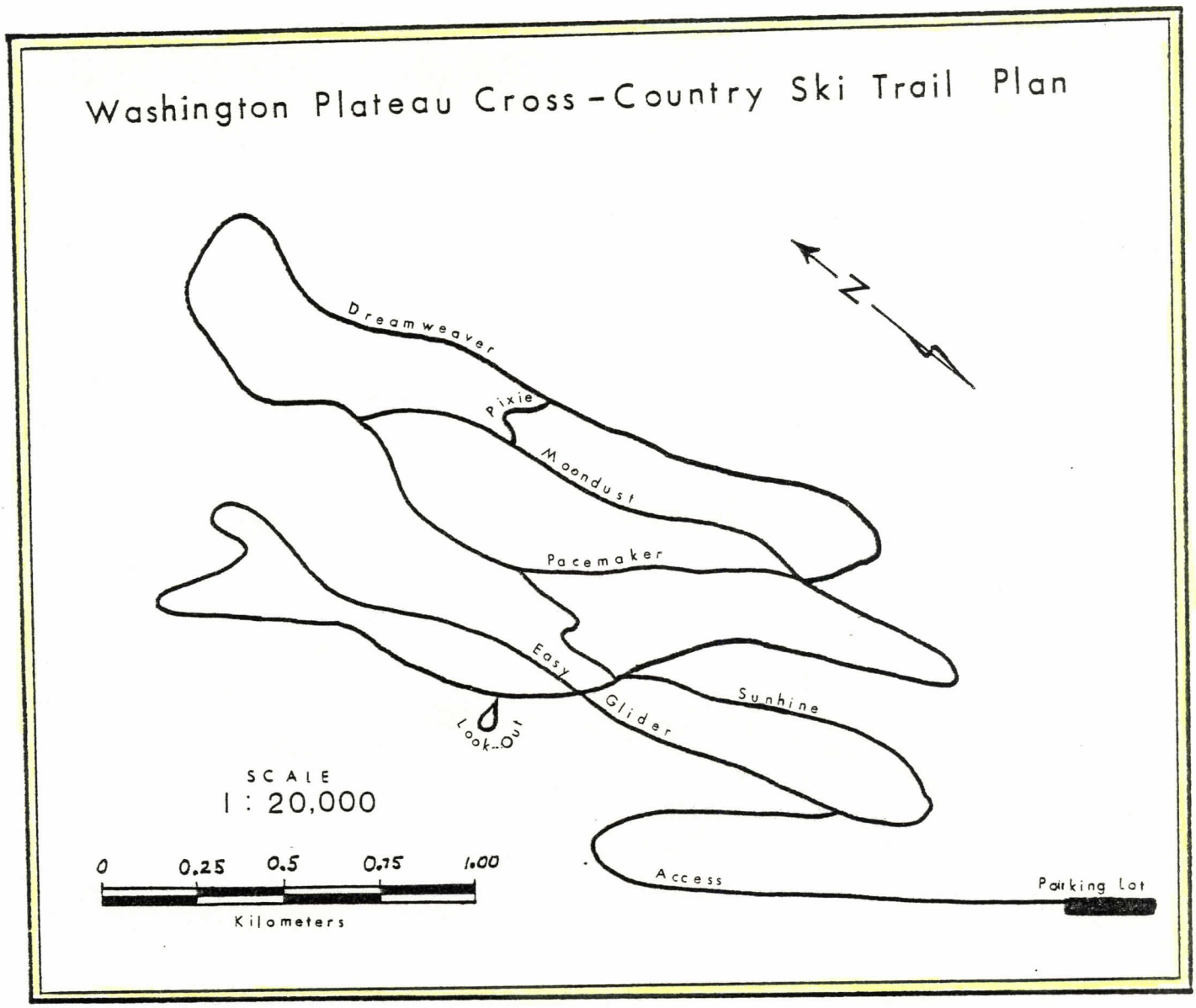
[4] Valentine K., Sprout P., Baker T., Lavkulich L.. The Soil Landscapes of British Columbia, The Resource Analysis Branch, Ministry of the Environment, Victoria, B.C.. 1978.

After becoming familiar with the Washington Plateau, I planned the location of 17 kilometres of cross-country ski trails. On the basis of the previously outlined criteria (Alberta Recreation and Parks Branch), and with the aid of aerial photographs, stereoscope, compass and clinometer, I flagged the trail locations over a five-day period in the field. I skied the cross-country trails in December 1979 and took photographs of the major features of each trail.

I recommend the final flagging of the proposed cross-country ski trails be done in late spring so that the locations I have advocated be refined and established so as the take advantage of areas which retain the snow longest.

The Washington Plateau Cross-Country Ski Trail Plan

Figure 5 illustrates the Washington Plateau Cross-Country Ski Trail plan. The trail layout is basically one of stacked loops, each loop being progressively longer and more challenging to ski.



The following are the details on each trail.

1) Access

Trail Length..... 3 km

Elevation..... 3600' - 3925'

Vertical Climb..... 325'

Status..... Beginner

I have not flagged the exact location of the Access trail as logging was actively taking place in the area during my field time. This is the most important trail in the system as it provides the means for cross-country skiers to reach the Washington Plateau. This trail will require the most construction time as it will be built primarily on sidehill. The trail will have to be cut into the slope with fill placed on the downhill side to facilitate a level ski surface. (Figure 6) The trail should be a minimum of 1.5 metres wide.

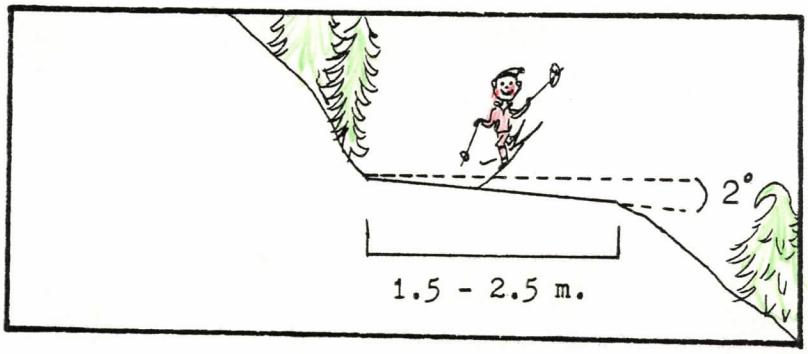


Figure 6: The bench produced should slope 2° to the outside to allow water to drain.

The slope of the trail must not exceed 10%. Dips should be included in the trail surface to allow skiers to check their speed upon descending. I foresee two creek crossings which will require bridging. Bridges need not be elaborate, but must be a minimum of 1.5 metres wide. (Appendix F).

Costing: (note; the costing figures are based on a trail crew wage rate of $6.00/hour using standards as provided by Timothy Knopps, author of Ski Touring Planner, 1972. appendix G).

1) Flagging: 2.5 km @ 2.5 km/day = $45.00
2) Initial brushing: primarily completed by Crown Zellerbach Logging Co.
3) Sidehill trail construction: 1200 m @ 30 m/day/man = $1800.00
4) Bridges: 2 1.5 mandays/bridge = $135.00

Total construction costs: $1980.00

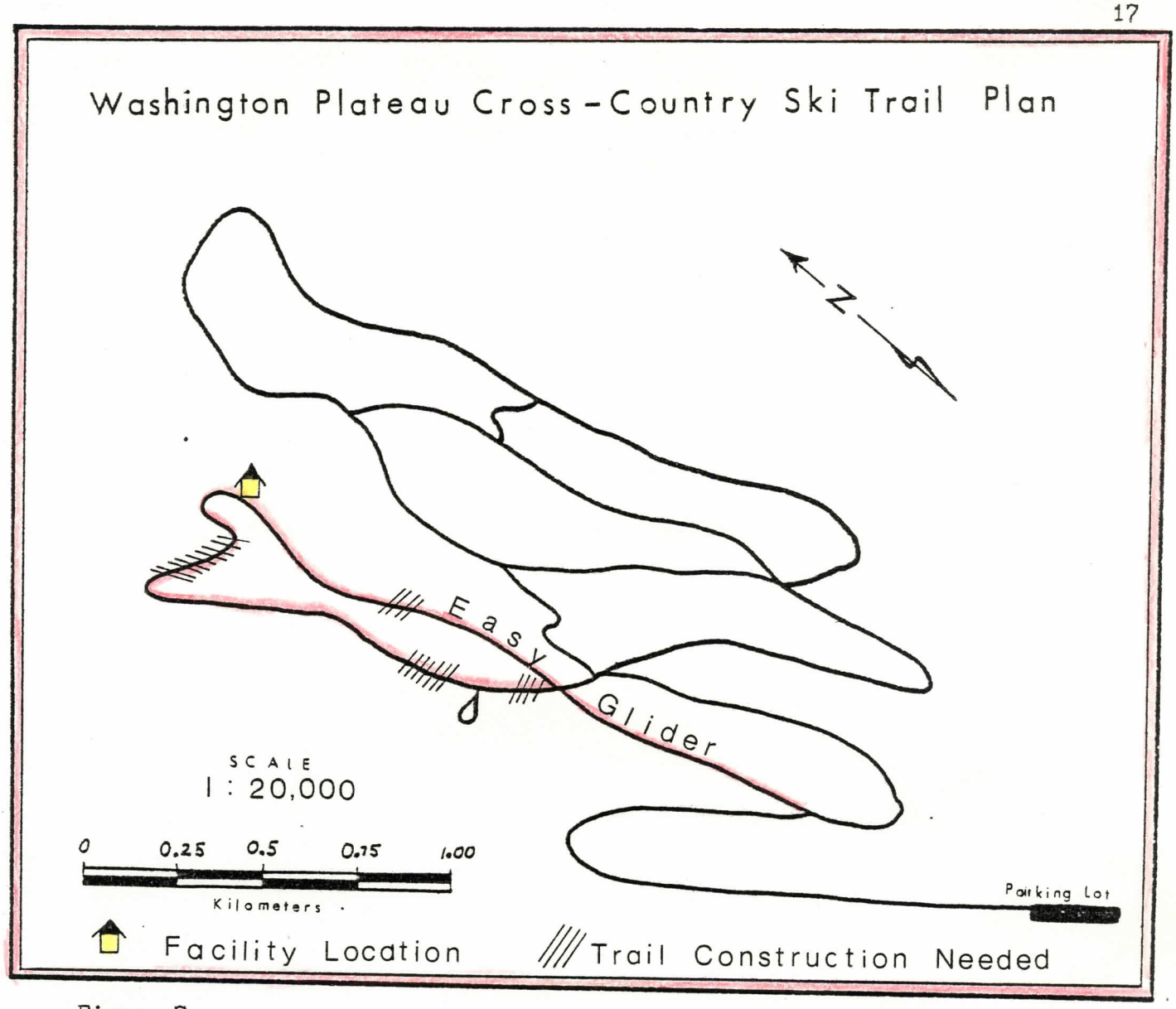


Figure 7

2) Easy Gilder

Trail length..... 4.0 km
Elevation..... 3925' - 3950'
Vertical Climb..... 25'
Status..... Beginner

2) Easy Glider

This trail begins at a shallow lake which remains frozen and snow-covered for the majority of the cross-country ski season (plate 5).

Plate 5

The meadow is wide enough to allow the skier the option of skiing beside the lake when the ice becomes unsafe (plate 6). The majority of this trail is unforested as it follows the length of two meadows (plate 7). It offers easy skiing; 2.6 km of the trail has a 0 - 5% grade and 1.4 km of the trail has a 5 - 10% grade.

I recommend a warming hut and toilet be established on the meadow to the far west (figure 7). This location is scenic, has a water source and could service all levels of cross-country skiers. More will be said about this later in the report (page40).

Plate 6: Skiers have the option of skiing beside the lake when the ice becomes unsafe.

Plate 7: Much of Easy Glider is naturally unforested.

Relatively little work would be required to construct Easy Glider due to the natural openings of the meadows as well as the presence of many abandoned game trails. The areas where construction is necessary are delineated on figure 7 .

Costing: (Easy Glider)

1) Initial brushing (level earth):1000m @ 500m/day = $90.00

2) Brush removal: 1000m @ 1000m/day = $45.00

3) Bridge building: 1 @ .5 mandays = $22.50

Total construction costs: $157.50

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3) Look - Out

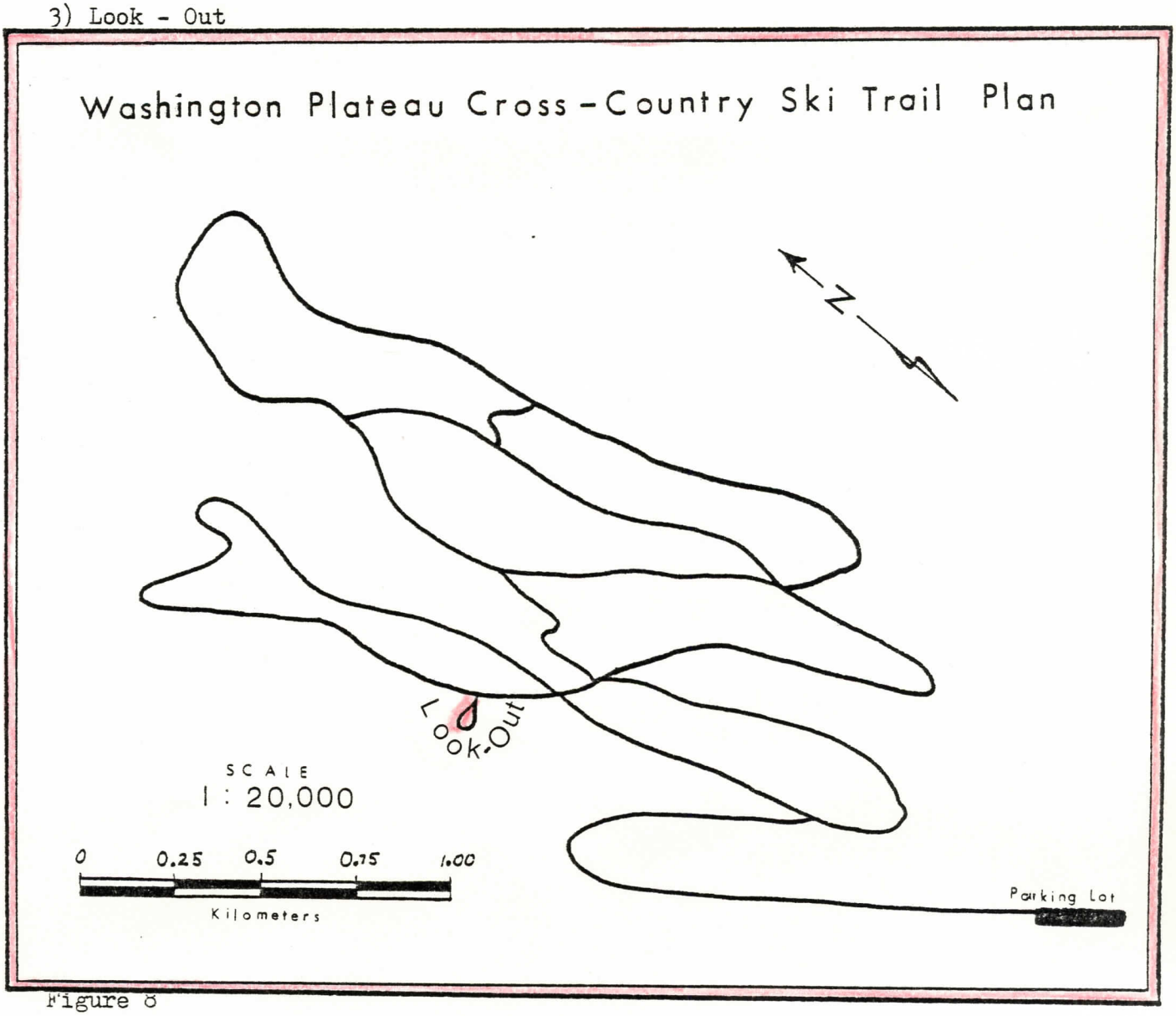


Figure 8

3) Look - Out

Trail Length..... 0.5 km
Elevation..... 3900'
Vertical Climb..... 25'
Status. ..... Beginner

Plate 8

This short loop takes the skier to the edge of the Washington Plateau at which a view of Strathcona Park, particularly Mt. Albert Edward, is exposed (plate 8).

Costing: (Look - Out)

1) Initial brushing (level earth): 100m @ 500m/day/man = $9.00

2) Brush removal: 100m @ 1000m/day/man = $4.50

Total construction costs: $13.50

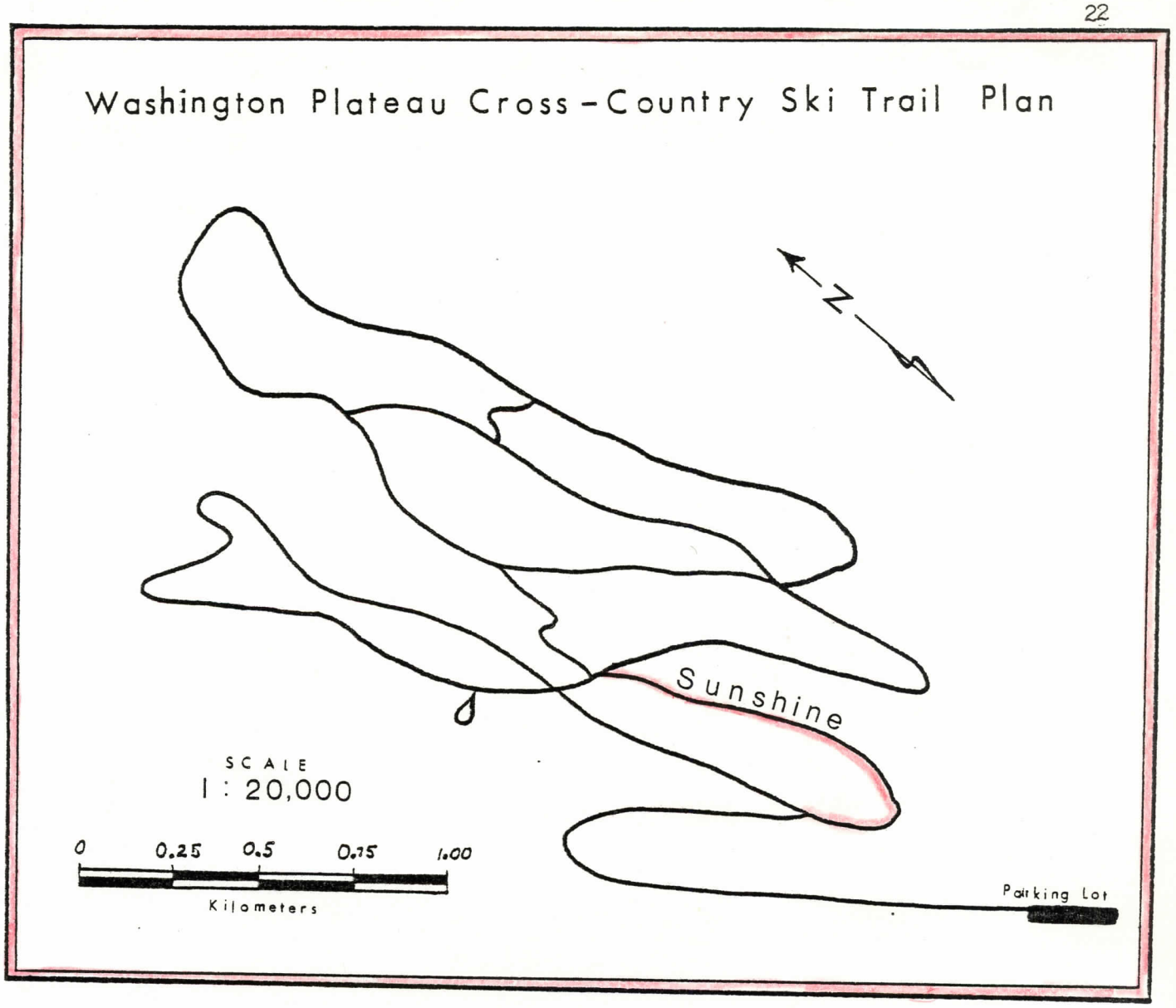


Figure 9

4) Sunshine

Trail Length..... 1.0 km

Elevation..... 3925' - 3975'

Vertical Climb..... 50'

Status. ..... Intermediate

Sunshine

This trail takes advantage of another natural meadow and offers the intermediate skier an alternate route to half of the Easy Glider trail. Fourty percent of the Sunshine ski trail lies within a forest; 60% is within open area (plates 9, 10, 11).

Plate 9: View of Mt. Washington from the Sunshine cross-country ski trail.

Plate 10: View of Mt. Alexandria from the Sunshine trail.

Plate 11: Cross-country skiing on the Sunshine meadow.

Costing (Sunshine)

1)Initial brushing (level earth): 300m @ 500m/day/man = $27.00

2)Brush removal: 300m @ 1000m/day = $13.50

3)Sidehill trail construction: 50m @ 30m/day/man = $75.00

Total Construction Costs: $115.50

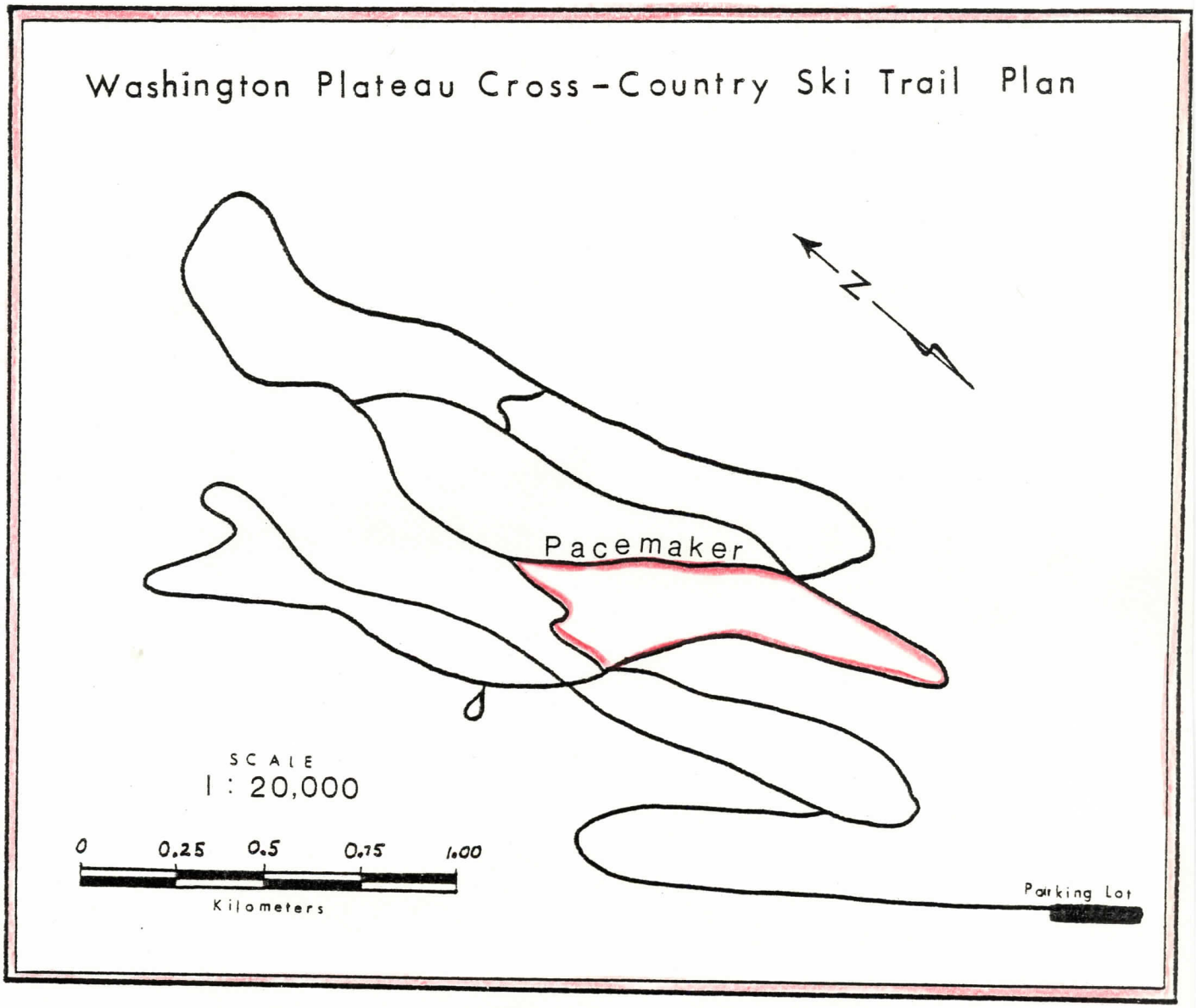


Figure 10

5) Pacemaker

Trail Length..... 3.5 km

Elevation..... 3925' - 4225'

Vertical Climb..... 300'

Status..... Intermediate

Pacemaker

Pacemaker has a minimal amount of level topography. The average grade on this trail is 10 - 15% (plate 12).

Plate 12

The maximum grade on this trail is 25% (plate 13). Half of Pacemaker follows natural clearings which require little in the way of construction. (Plate 14). However, the areas of the trail which are located on sidehill or on a steep slope require more construction effort as these areas demand a level surface or clearing of a run-out area for descending skiers. There will be a few corners which will require banking.

Plate 13: The maximum grade on this trail is 25%.

Plate 14: Half of the Pacemaker trail follows natural openings.

Costing (Pacemaker)

1) Initial brushing: 1400m @ 500m/day/man = $90.00
2) Brush removal: 1400m @ 1000m/day/man = $63.00
3) Sidehill trail construction: 800m @ 30m/day/man = $1200.00

Total Construction Costs: $1389.00

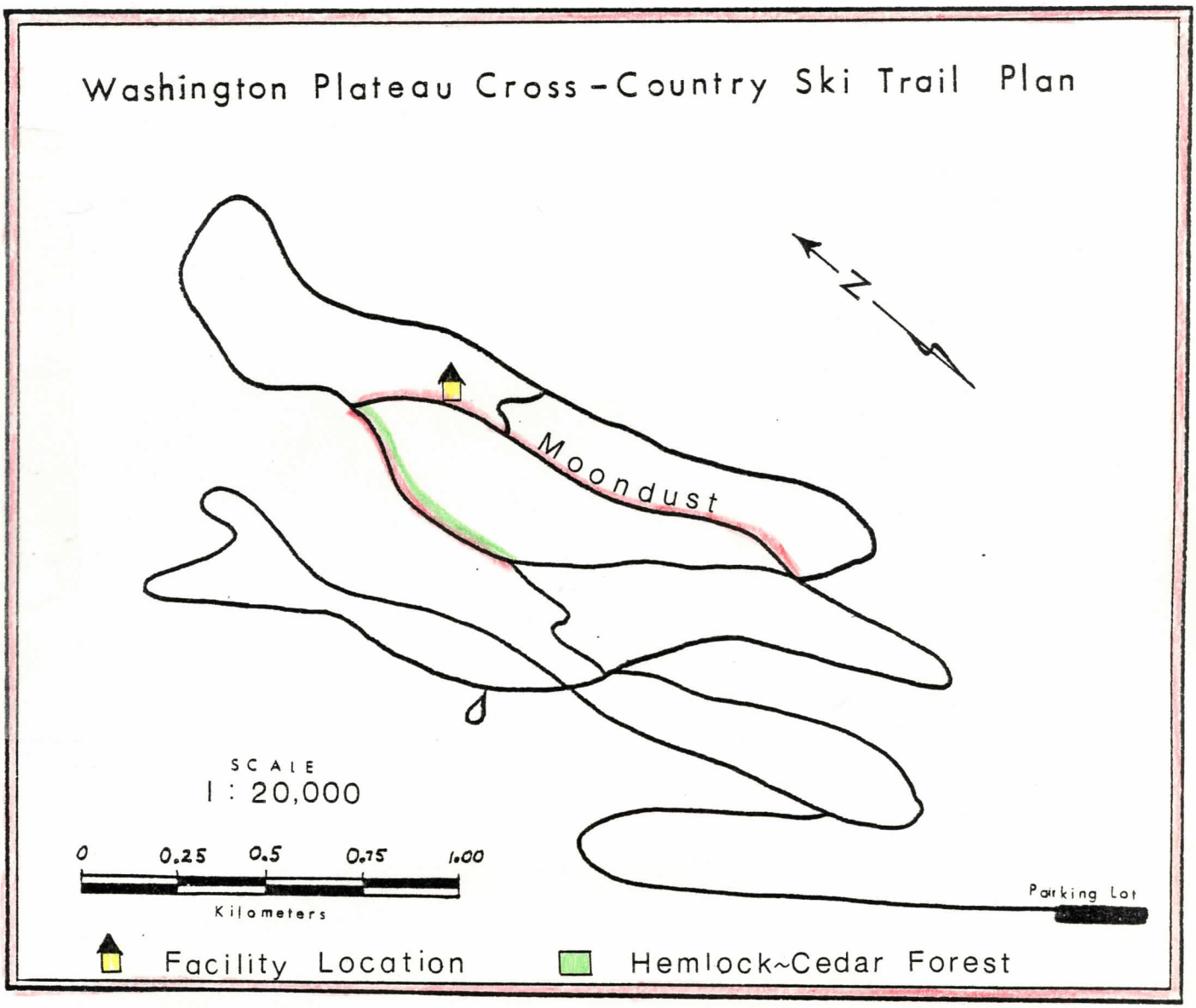


Figure 11

6) Moondust

Trail Length..... 2.0 km
Elevation..... 4100'- 4225'
Vertical Climb..... 125'
Status..... Intermediate

Moondust

This trail forms a loop stacked on to the west side of Pacemaker. The 0.8 section of trail delineated on figure 11 takes the skier through a very attractive mature hemlock - cedar forest which has a minimum of understory (plate 14).

Plate 15.

This portion of Moondust is at a constant grade of approximately 15%. The remaining 1.2 km of the trail primarily follows the 4175' contour interval with a grade fluctuation of 0 - 10% (plate 16, 17, 18). At this height, the skier can view the scenic mountains of the Forbidden Plateau to the west.

Plate 16: 1.2 km of Moondust follows the 4175' contour interval with a grade fluctuation of 0 - 10%.

Plate 17: Much of Moondust follows natural openings.

I recommend a shelter and toilet facility be located on the Moondust trail (see figure 11 for location). At this location, a water source is nearby and the shelter is readily accessible to the intermediate as well as the advanced skier.

Plate 18: Moondust cross-country ski trail.

Costing (Moondust)

1) Initial brushing: 400m @ 500m/day/man = $36.00
2) Brush removal: 400m @ 1000m/day/man = $18.00
3) Sidehill trail construction: 400m @ 30m/day/man = $600.00

Total construction costs: $654.00

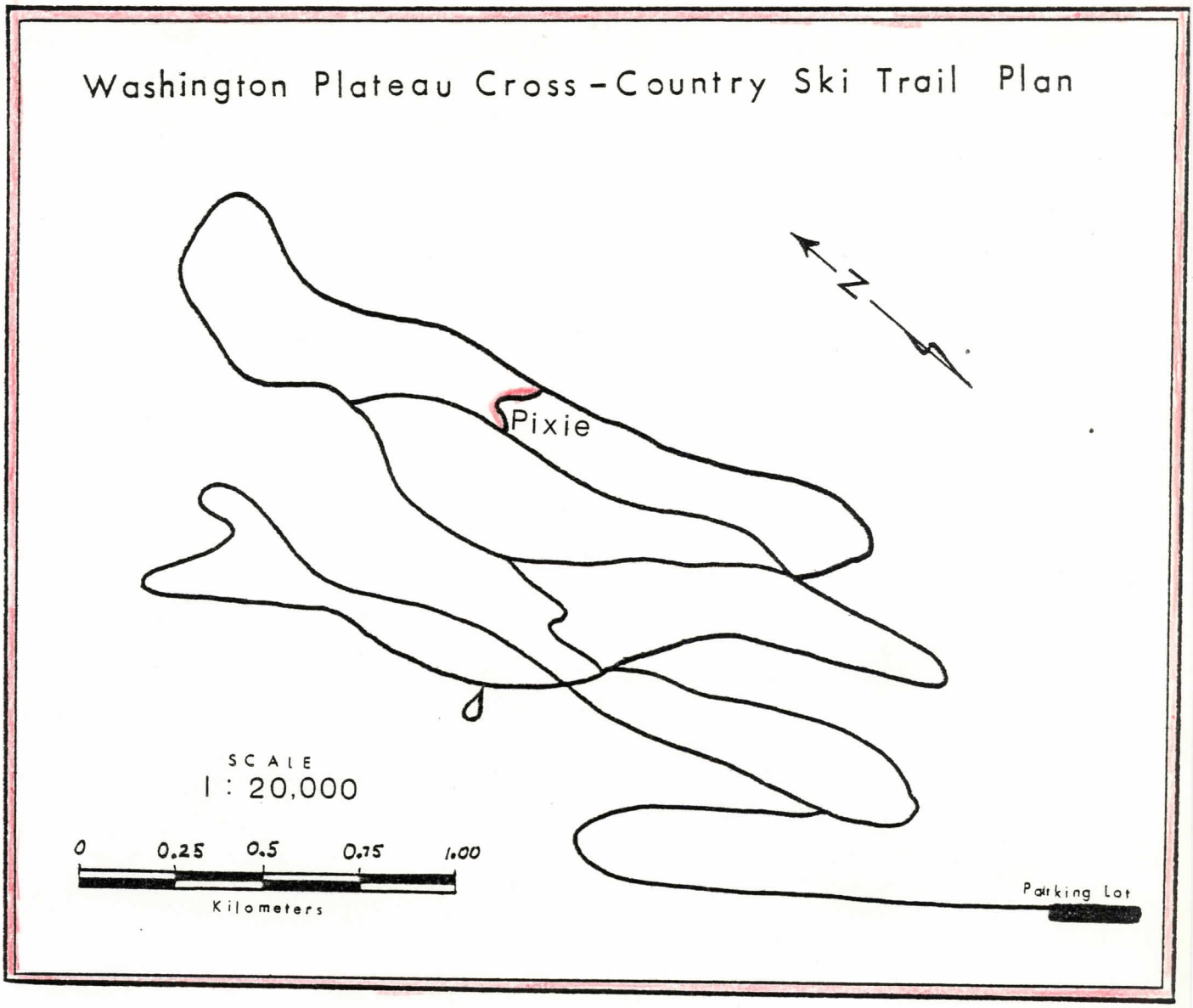


Figure 12

7) Pixie

Trail Length..... 0.2 km

Elevation..... 4175' - 4200'

Vertical Climb..... 25'

Status..... Intermediate

Pixie connects Moondust and Dreamweaver. It creates an option for the skier who wishes a direct route to either of these loops. Pixie has a grade of approximately 20% and has one corner which must be properly banked and provide adequate room for turning. The meadows at the lower end of the trail (on the Moondust trail) create a natural run-out area for the descending skier.

Costing (Pixie)

1) Initial brushing: 200m @ 500m/day/man = $18.00
2) Brush removal: 200m @ 1000m/day/man = $9.00
3) Sidehill construction: 30m @ 30m/day/man = $45.00

Total construction costs: $72.00

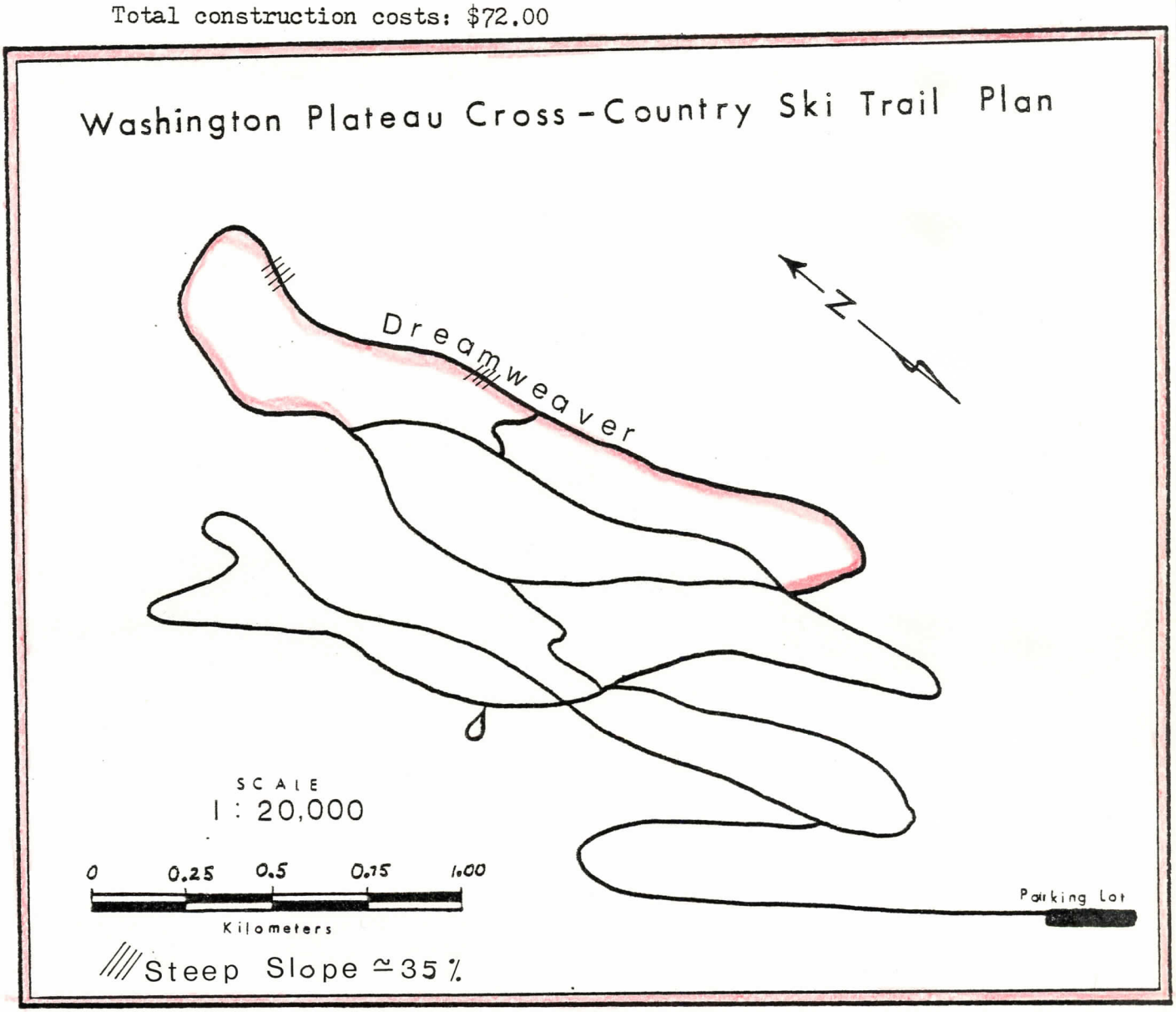


Figure 13

8) Dreamweaver

Trail Length..... 4.0 km
Elevation..... 4175' - 4400'
Vertical Climb..... 225'
Status..... Advanced

Dreamweaver

This trail forms the loop highest in elevation and is stacked onto Moondust. Midway along Dreamweaver, Pixie forms an intermediate connection to Moondust.

Approximately 1.5 km of Dreamweaver requires no construction as it is located on meadows. The meadows follow the 4400' contour interval and are gently undulating with grade fluctuations of 0 - 15%. The trail is given advanced status because two steep slopes (see figure 13) have grades of up to 40%. These steep sections do not exceed 25 metres in length and fortunately natural run-out areas are provided at the bottom of these slopes by the meadows (plates 19, 20).

Plate 19

Plate 20

Plates 19 and 20 illustrate the natural run-out areas created by meadows situated below steep slopes. Plate 19 was taken in August; plate 20 was taken in December, 1979.

Dreamweaver is well worth the ski tour up. It affords the skier a spectacular panorama of some of the mountains in Strathcona Park and the Forbidden Plateau, from the Comox Glacier to Mt. Alexandria (plate 21).

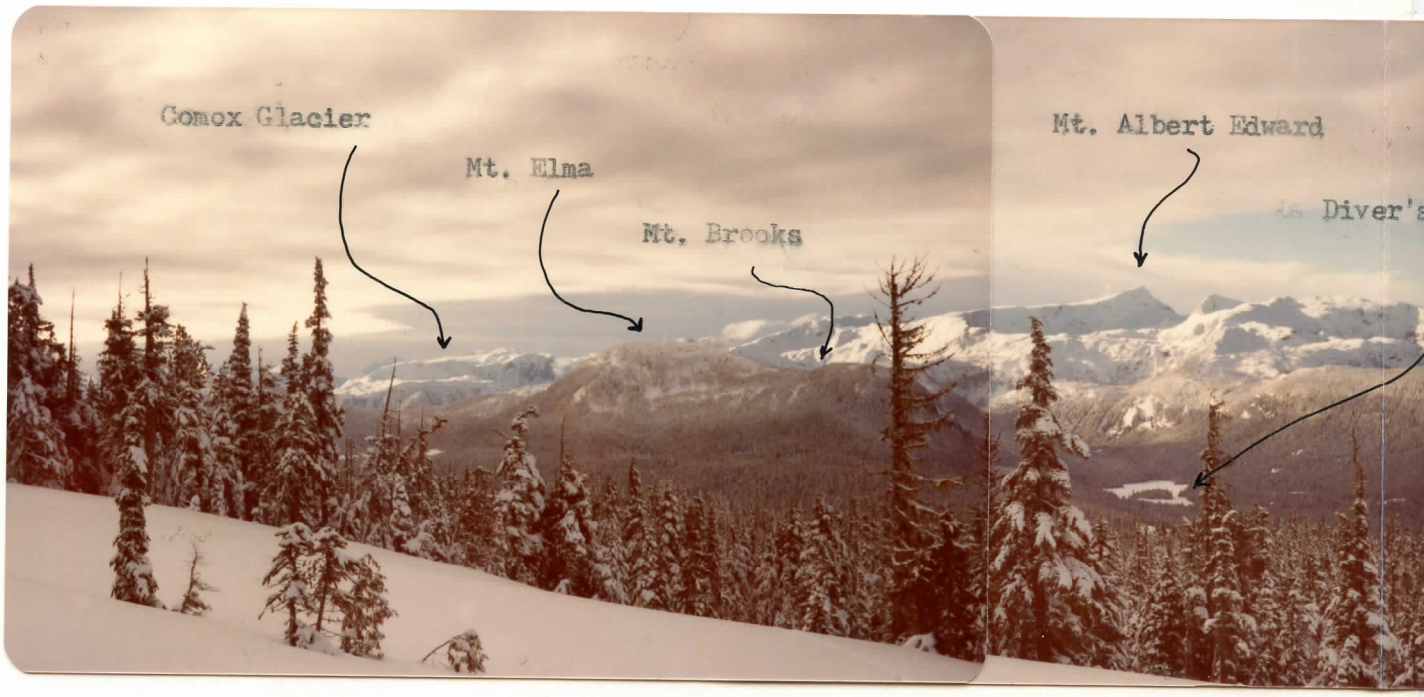


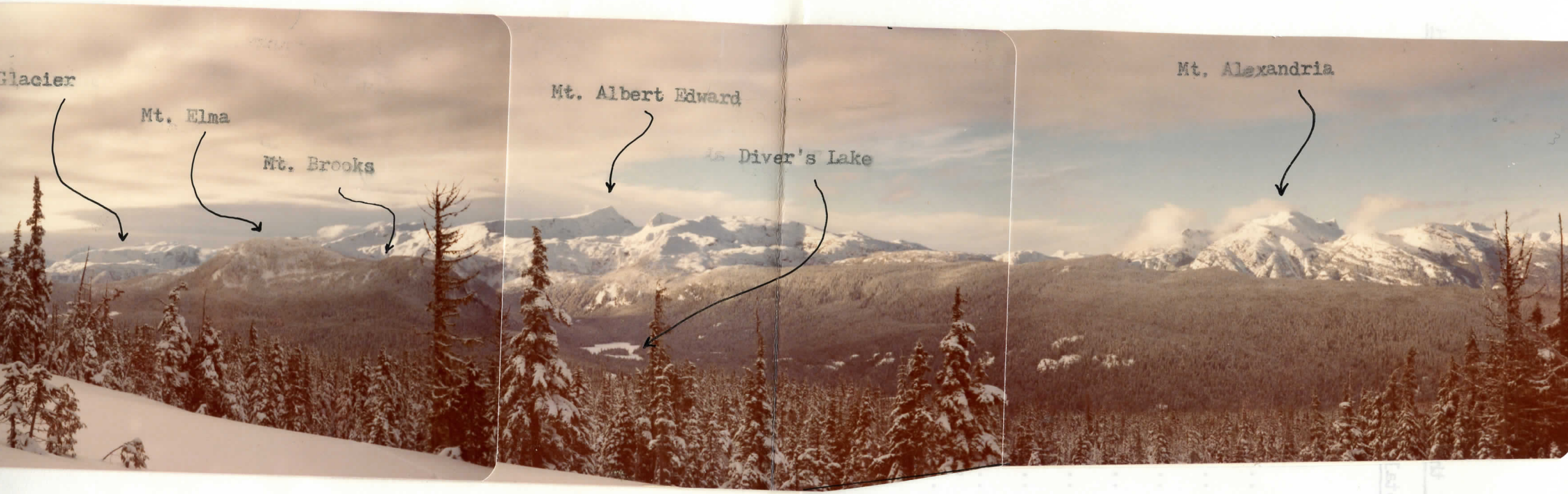
Plate 21: Panoramic view from Dreamweaver.

Costing (Dreamweaver)

1) Initial brushing: 1400m @ 500m/day/man = $126.00
2) Brush removal: 1400m @ 1000m/day/man = $63.00
3) Sidehill trail construction: 300m @ 30m/day/man = $450.00

Total construction costs: $639.00

Plateau, from the Comox Glacier to Mt. Alexandria (plate 21).



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Priority for the Development of the Washington Plateau Cross-Country Ski Trail System and Total Trail Construction Costs

1) Access.....$ 1980.00

2) Easy Glider..... $ 157.50

3) Look-Out.....$ 13.50

4) Sunshine.....$115.50

5) Moondust.....$ 654.00

6) Dreamweaver.....$ 639.00

7) Pixie.....$ 72.00

8) Pacemaker..... $ 1389.00

Grand Total. .....$ 5020.50

(Refer to appendix H for sources for funding trail work.)

Signing

Trail signs are essential for the safety and convenience of the skier. These include: trail identification markers, distance signs, and trail blaze reassurance markers.

Oversigning is unsightly and unnecessary. There should be adequate signing so a skier will feel comfortable and know exactly where he/she is in relation to the parking lot or destination at any point along the trail. Trail blaze markers should be spaced such that, on a foggy day, a skier can see the next blaze from the previous one.

In order to simplify the signing scheme, I recommend that aerial photograph blow-ups ($100cm^2$) be placed at every trail junction with a "you are here" at the appropriate spot on the photograph. (Figure 14).

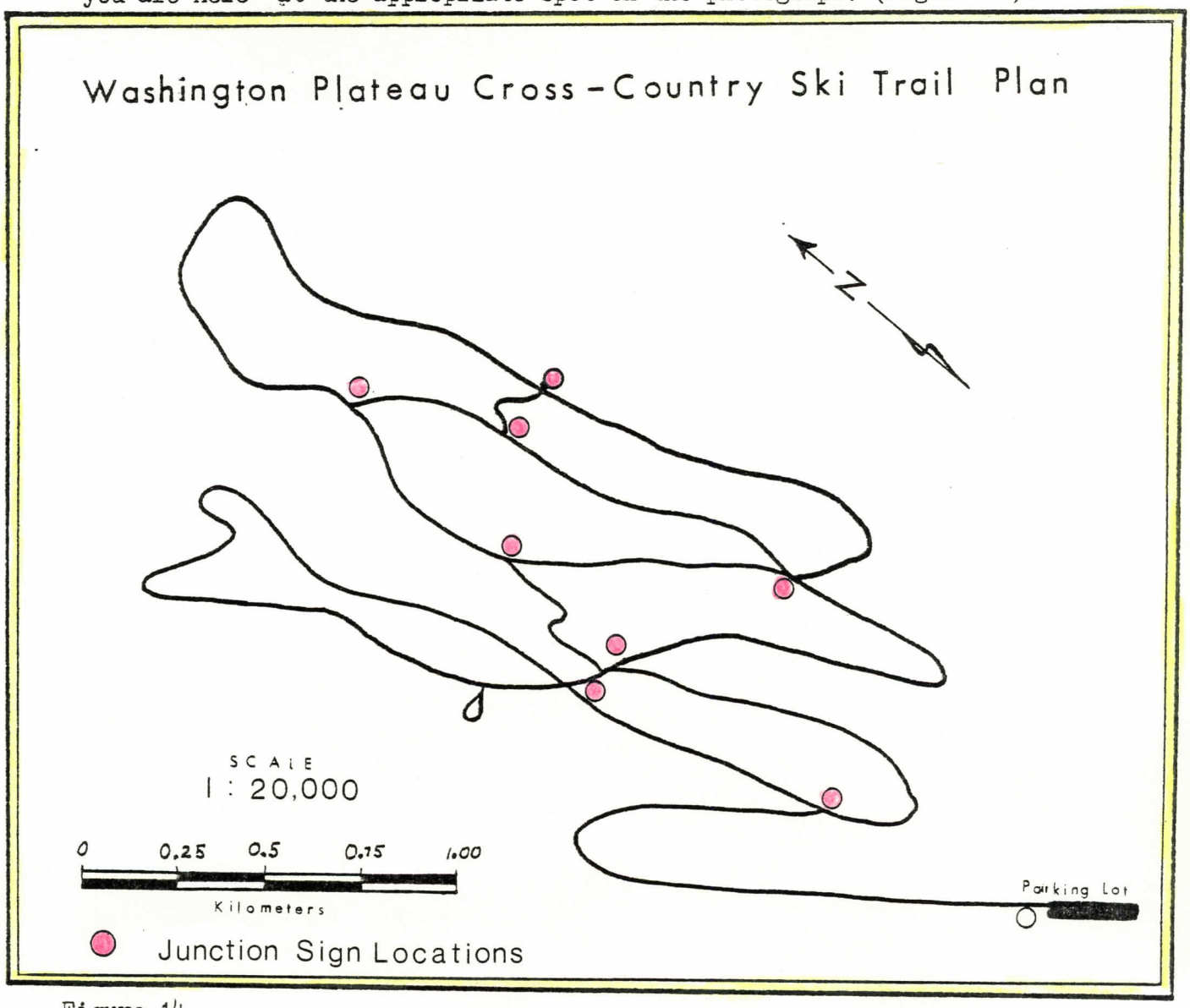

Figure 14

Nine aerial photograph blow-ups are required at the Washington Plateau Cross-Country Ski Trail Area. Blow-ups to dimensions of 100 cm by 100 cm of air photo number 270, flight line B.C. 7794, can be ordered from the Map Production Division, Surveys and Mapping Branch, Ministry of the Environment, Victoria, B.C. at a cost of $25.00/photo. The photos should be laminated with clear plastic and glued onto a partical board backing. The signs should be mounted on a post of adequate height so that they are viewed at eye level during the ski season. (Appendix I).

Figure 15 illustrates the information that should be included on an aerial photo blow-up.

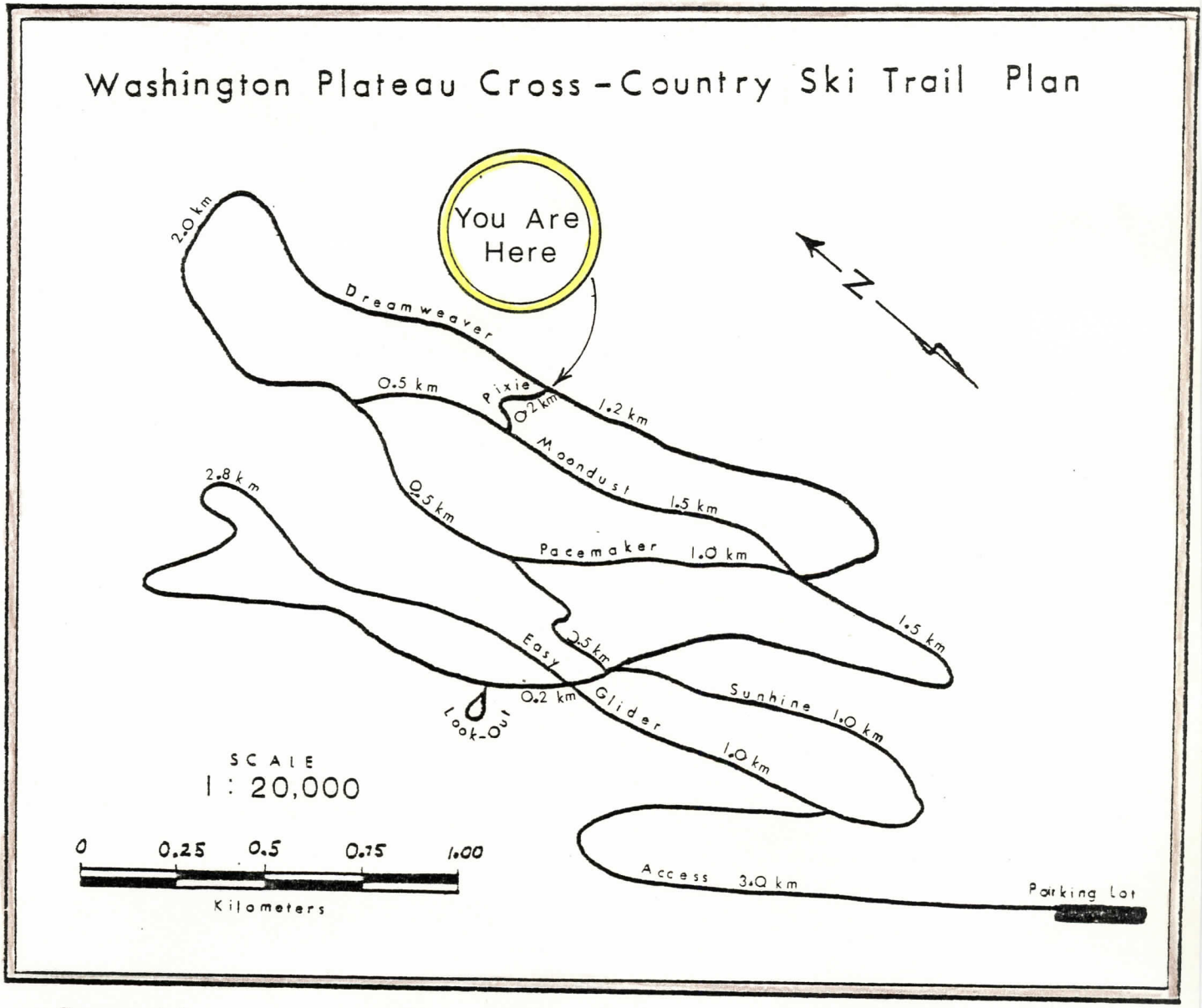

Figure 15

Figure 16 is an example of the information to be included on trail identification markers. These are also to be located at each junction.

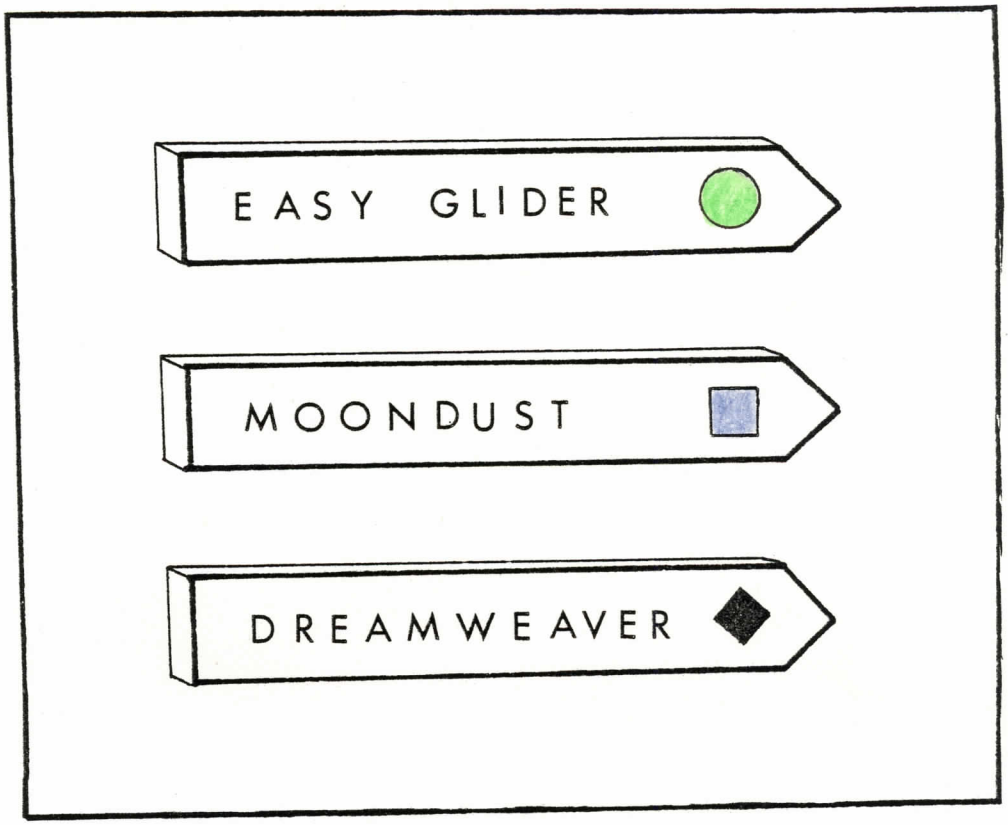

Figure 16

Costing (Signing Scheme)

1) 9 junction signs (aerial photo blow-ups) @ $30.00/sign = $270.00

2) 10 rolls surveyors tape @ $6.50/roll = $65.00

3) 20 trail identification signs @ $7.00/sign = $140.00

4) Entrance sign = $100.00

Total signing costs: $ 575.00

Facility Design

The level of use and conciousness of the users will determine the type of structure required on the Washington Plateau. Shelters can range from simple tree windscreens to roofed, three-sided shelters, to elaborate chalets with fireplaces and food services. The shelter and toilet design should compliment the winter environment and the uniqueness of the sport. It should provide cross-country skiers with a resting area and a place to warm up and socialize.

For purpose of calculations, I have estimated shelter/toilet costs to be $1000.00 per unit.

Tracksetting

In my opinion, mechanically track-set cross-country ski trails are not essential; however, they are easier to balance on for beginner skiers. Therefore, I recommend that the Access and Easy Glider ski trails be track-set regularily by mechanical means.

Grooming and conditioning the track are keys to good tracksetting (appendix J). Factors to consider in track-setting include snow temperature and moisture content, surface and subsurface snow conditions, wind, and the short-term weather forecast. Trails should be compacted consistently throughout the season or after every 15 cm of snowfall. This will promote a longer ski season as well as prepare the track for track-setting.

A track should not be set on sharp corners or steep downhills. Since the Washington Plateau Cross-Country Ski Trail System will remain as two-way trails until use warrants a one-way system, I recommend tracks be set beside a packed, un-tracked section of trail on steep hills. This will allow experienced skiers to maintain a rhythm while ascending or descending the hill; the packed area will facilitate "herringboneing" and snow-plowing by less experienced skiers. (Figure 17).

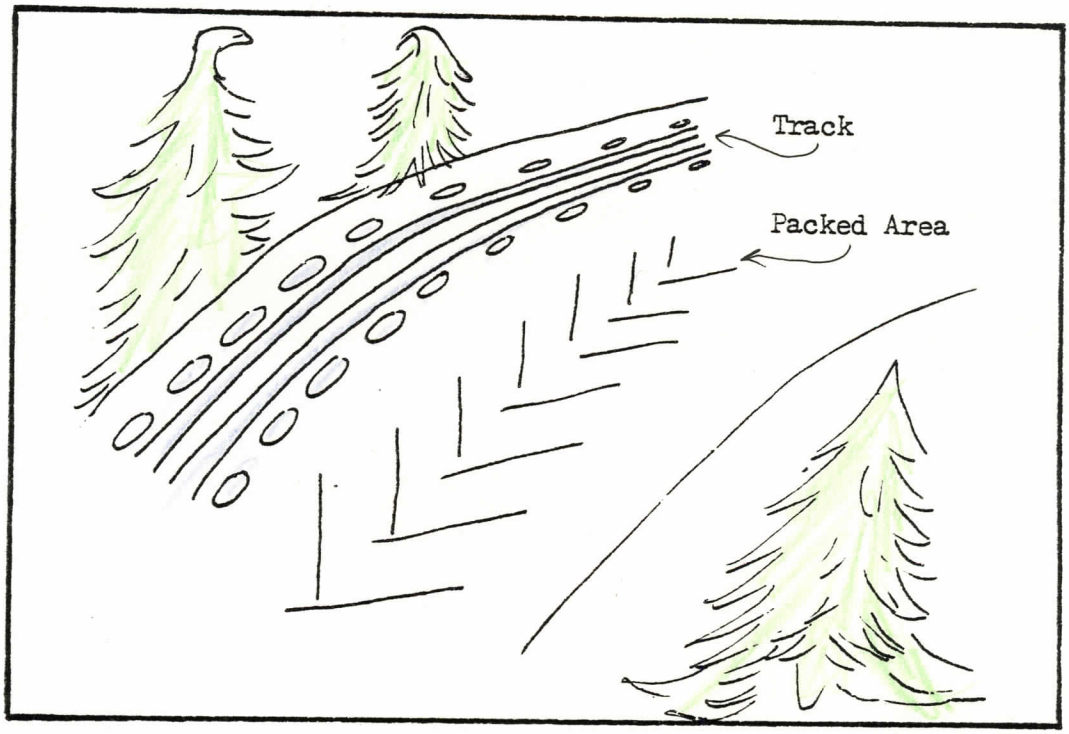

Figure 17 : Track-setting procedure on hills. Note: it is important to pack the area 0.5 metres on either side of the track to allow for the firm planting of ski poles. (Appendix J).

Liability

Good management is the best defense against liability. The public must be made aware of the management policy regarding liability. A disclaimer should be stated on the trailhead sign, cross-country ski ticket and advertising brochure (appendix K).

I recommend that trail conditions be posted daily at the trailhead and that hazard signs be posted along the trail where necessary. The trails should be inspected and patrolled regularly. I also recommend that certified members of the Canadian Association of Nordic Ski Instructors (C.A.N.S.I.) be hired in the ski school as these members are given $1,000,000.00 liability coverage. (Appendix L).

The skier who is paying for use of the trails will expect a professional quality of trail maintenance and operations.

Revenue

1) Fees

Charging skiers for cross-country skiing is a common practice in eastern Canada but rare in B.C. because the market in western Canada is virtually untapped. I believe that cross-country skiers will soon realize that if they want groomed and maintained trails, facilities and good service, they will either have to pay or pitch in and make it happen. I suggest that a trail-use fee of $ 1.50 /person be assessed for the Washington Plateau Cross-Country Ski Trail Area.

I recommend that a person be hired for cross-country ski trail operation. This person should be stationed at the entrance to the parking lot from 8:00 a.m. to 1:00 p.m. to collect trail-use fees. It should also be this persons responsibility to track-set the Access and Easy Glider trails

when necessary, maintain the facilities, post the current cross-country ski trail conditions, and patrol the ski trails at the end of the day. I suggest an $800.00/month wage for this person.

When the amount of revenue collected demands greater security of fee collection, I recommend a ticket booth be installed at the parking lot entrance. I estimate the cost of construction of the ticket booth and electrical hook-up to be $1000.00.

2) The Rental Shop

The rental shop can bring the most revenue in the cross-country operation. Cross-country ski equipment rentals can be integrated with the downhill ski rentals located at the Mt. Washington Ski Resort day-lodge. Although cross-country ski equipment is relatively inexpensive to purchase, it can be rented for the same fee as that charged for down-hill equipment, and sometimes the same piece of equipment can be rented twice in one day. The rental shop should also make accessories such as waxes, corks, scrapers, touques, gloves, etc., available for purchase as cross-country skiers will always be in the market for such items.

School children are a good resource for ski rentals and package deals with the institutions should be encouraged.

Costs and Scheduling

1st Season (November 15 to April 15)

Trail Construction Costs	$5,000.00
Shelter Construction Costs (located on Easy Glider)	$1,000.00
Ski Trail Operator's Wages	$4,000.00
Signing Costs	$ 600.00
Total Construction and Operation Costs	$10,600.00

I predict that 10 vehicles will be in the cross-country ski parking lot per day on the average during the first year of operation. I assume a mean of three persons per vehicle. By assessing the trail-use fee I have advocated of $1.50/person, the projected revenue will average at $45.00/day.

This would mean that the investment costs would be paid for after 235 cross-country skier days. After the first season of operation, the investors will be at a deficit of $3,850.00. However, cross-country skiers will generate revenue which will off-set this deficit by utilizing the rental shop, cafeteria, lounge, etc., as well as by taking cross-country ski lessons.

2nd Season

Shelter Construction Cost (located on Moondust)	$1,000.00
Ticket Booth Construction Cost	$1,000.00
Ski Trail Operator's Wages	$4,000.00
Total Construction and Operation Costs	$6,000.00
1st Season's Deficit	$3,850.00
	$9,850.00

2nd Season

I predict an increase in the number of vehicles in the parking lot to at least 15 vehicles per day on the average.

15 vehicles/day × $4.50/ vehicle = $67.50 revenue/day

150 cross-country skier days/season × $67.50 = $10,125.00

During the second season of operation, a profit of $275.00 wil be made from the cross-country ski trail system.

3rd Season

Ski Trail Operator's Wages.....$4,500.00

I project an increase of cross-country skiing in the area to maintain an average of 20 vehicles/day in the parking lot.

20 vehicles/day × $4.50/vehicle = $90.00 revenue/day

150 cross-country skier days/season × $90.00 revenue/day = $13,500.00

Profit for cross-country ski trail operation.....$ 9,000.00

After the third season of operation, a profit of $9,000.00 is predicted. In future ski seasons, I expect the money to drift in as the snowflakes do. (Note: the above calculations are approximate only. They do not take into consideration inflation of operating costs and the compensating rise in trail use fees.)

Conclusion

To create the cross-country ski trail system I have presented will cost approximately $8,600.00. This capital investment is relatively small in comparison to the cross-country ski market potential. I have projected the Washington Plateau Cross-Country Ski Trail Area to generate a profit of $9,000.00 after its third season of operation.

The development of the cross-country ski trail system I have proposed will enhance the total resort package, particularly the proposed alpine ski village by adding another dimension to the winter recreation experience. The result may be a new breed of skier capable in both downhill and cross-country ski diciplines. Once the trails have been developed, they can be advertised as the most outstanding cross-country ski area on the coast of B.C. and I truly believe they will be extremely lucrative if developed in an organized manner.

The time is right for the developers of Mt. Washington Ski Resort to include cross-country skiing in their plans and to tap a virtually unlimited market.

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APPENDIX "A"

THE MT. WASHINGTON SKI RESORT

Ski School

THE MT. WASHINGTON HEAD-WAY® SKI SCHOOL remembers what it is like to learn how to ski. Using the Canadian Ski Instructors Alliance technique and revolutionary HEAD-WAY® method you will learn and experience skiing. Learning skiing is very rewarding! Ski lessons on Mt. Washington are next to paradise!

HEAD-WAY® is the safe, simplified way to learn skiing, quickly, easily, inexpensively, and it is guaranteed. If you cannot ski the Green Chair in control after five lessons, we teach you for free until you can.

ALSO AVAILABLE: private lessons, junior lessons, cross-country packages, and for those under six years of age the pre-schoolers meet every day at 12:00 noon.

WRITE OR PHONE the Mt. Washington office for the Mt. Washington HEAD-WAY® Ski School brochure.

ADDRESS:

Mt. WASHINGTON HEAD-WAY® SKI SCHOOL
2040 Cliffe Ave., Courtenay, B.C., V9N 2L3
Telephone: (604) 338-1515

Rentals

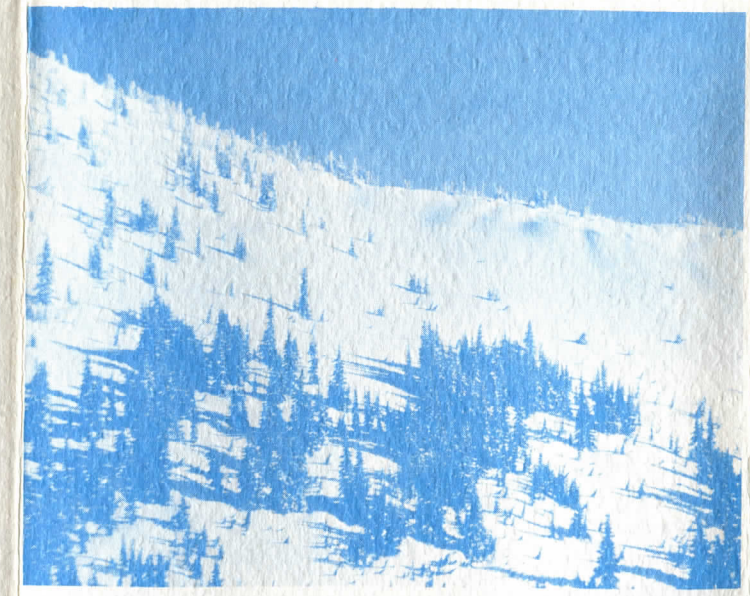
Located in the Day Lodge are complete ski, boot and pole outfits, both Alpine and Cross-country. Expert and certified staff are on duty to handle repairs and accessory sales.

ALPINE

	Daily Rate
COMPLETE ADULT OUTFIT (skis, boots, poles)	$ 9.00
ADULT SKIS ONLY	7.00
12 AND UNDER (complete outfit)	7.00
12 AND UNDER (skis only)	5.00
CHILDREN 7 AND UNDER (complete outfit)	5.00

CROSS-COUNTRY

COMPLETE ADULT OUTFIT (skis, boots, poles)	$ 8.00
12 AND UNDER (complete outfit)	6.00



MOUNTAIN OPERATED BY:

MT. WASHINGTON SKI RESORT LTD.
2040 Cliffe Ave., COURTENAY, B.C., V9N 2L3
Telephone: (604) 338-1515

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Mt. Washington

Next to Paradise!

MT. WASHINGTON SKI RESORT LTD.
2040 Cliffe Ave., Courtenay, Vancouver Island, B.C.
Canada, V9N 2L3 • Telephone: (604) 338-1515

Welcome to the newest ski area on Vancouver Island

Mt. Washington

• 31 kilometres (19 miles) west of Courtenay, Mt. Washington is skiing at its finest! a location for all abilities - beginner to advanced. 490 vertical metres (1,600 feet) of skiing (longest run 3 km) wilderness alpine, first class services. RELAX BRING YOUR FAMILY AND FRIENDS

. . . come and ski Mt. Washington

Next to Paradise

Operations

DAILY OPERATION:

December to April
1979 to 1980

HOURS OF OPERATION:

9:00 a.m. to 3:30 p.m.

Address

(as of October 1, 1979)

OFFICE:

2040 Cliffe Avenue
Courtenay, B.C., V9N 2L3

PHONE:

(604) 338-1515

SNOW REPORT INFORMATION:

Write or phone Mt. Washington office for details.

The Future is Bright

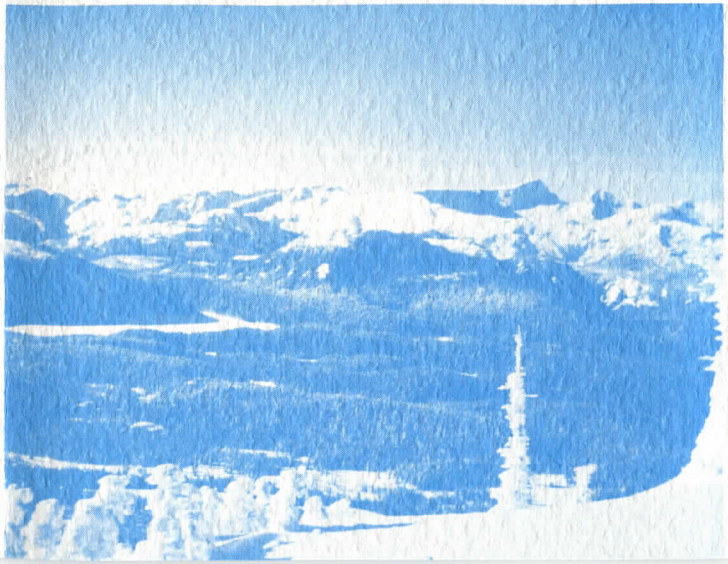
A Ski Village, fully serviced, and situated in an incredibly beautiful alpine plateau, is the heart of Mt. Washington.

We are already planning a new lift for the 1980-81 season. It will be a Triple Chair going from 1090 metres to 1390 metres above sea level, with a carrying capacity of 1,800 people.

Over the next several years, four additional lifts are proposed.

The Day Lodge

The Day Lodge has been designed to keep you happy and warm. With 2,139 sq. metres (21,000 sq. feet) of people space, it offers the following services: Lift tickets, information, washrooms, cafeteria, lounge, rentals, repairs, accessory shop, ski school, lost and found, first aid and one very important thing — FRIENDLY AND HELPFUL STAFF, the key to your good day.



Tickets and Prices

	12 years and under	Over 12 years
Daily ticket, all lifts	$ 6.00	$ 9.00
Half day, all lifts (after 12:45 p.m.)	4.00	6.00
Children under seven ski free (must wear courtesy pass)		
Any five consecutive days = 20% OFF		
SEASONS PASS*	$110.00	150.00
Family, first two		250.00
Each additional dependent (18 years and under)		55.00
After four passes in one family Free for maximum of four		
Senior Citizens		55.00

**Sales commence October 1, 1979*

Cafeteria and Lounge

Rest between runs and restore your energy. Mt. Washington has a very modern food service section and lounge, catering to the hungry and thirsty skier.

Next to Paradise!

Lifts

Our lifts, two Mueller double chairs and a Borer beginner tow, will give everyone a chance to not only ski the entire mountain, but to take in the view!

CHAIR #1 • BLUE

Length: 1408 m 4620 ft. *Vertical:* 386 m 1268 ft.
Capacity: 1200 pph.
Elevation: 1190 - 1576 m - 3900 - 5168 ft.

CHAIR #2 • GREEN

Length: 686 m 2250 ft. *Vertical:* 140 m 342 ft.
Capacity: 1440 pph.
Elevation: 1098 - 1202 m - 3600 - 3942 ft.

BEGINNER LIFT

Located northwest of the Day Lodge within 40 metres of the rental shop.

Guide to Downhill Terrain

- □ – 1. WESTERLY
- ◇ – 2. TYEE
- ◇ – 3. RED
- ◇ – 4. EAGLE
- ◇ – 5. HAWK
- ◇ – 6. CHIMNEY
- □ – 7. FREEWAY
- ◇ – 8. OH HENRY
- ◇ – 9. BULL RUN
- ◇ – 9-a RIGHT BULL
- ◇ – 9-b LEFT BULL
- □ – 10. WHISKEY JACK
- □ – 11. KEN'S RUN
- □ – 12. CONNECTOR
- □ – 13. FLUTE
- □ – 14. OBOE
- □ – 15. PICCOLO
- □ – 16. RETIREMENT
- □ – 17. LINTONS LOOP
- □ – 18. CHUTE
- ○ – 19. HOME RUN
- ○ – 20. MARMOT
- ○ – 21. BEAR
- ○ – 22. ELK
- ○ – 23. DEER

A ALPINE VILLAGE
B DAY LODGE
C PARKING AREA
D BASE BLUE CHAIR
E BASE GREEN CHAIR
F BASE PROPOSED TRIPLE CHAIR
G SUMMIT MT. WASHINGTON
H POWDER FACE
I HARMONY MEADOWS
J BEGINNER LIFT

○ EASIER
□ MORE DIFFICULT
◇ MOST DIFFICULT
— — — AREA BOUNDARY

Ski Patrol

We have a volunteer and professional patrol, Vancouver Island's first!

Please report all accidents to lift operators or the ski patrol. Indicate the accident site by placing skis in an X position above the injured party.

The first aid room is in the Day Lodge, on the main floor.

Mt. Washington reserves the right to revoke any lift ticket for reckless or out of control skiing, for failure of the holder to observe its rules and regulations, and skiing through closed signs and closed areas.

NOTICE: *No public snowmobiles allowed in the ski area. This policy is for the safety of all concerned!*

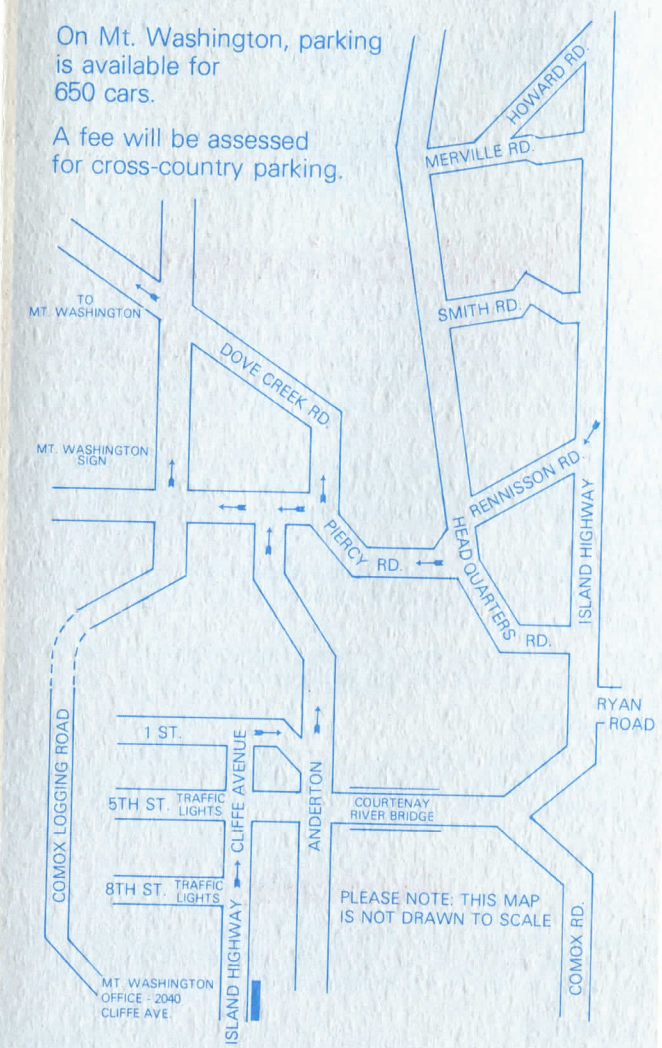
ALL SKIERS: *ski area boundaries are well marked. Please stay within the borders.*

Access and Parking

A ski bus leaves Courtenay every day. As an added convenience, a shuttle bus will run from the base of Mt. Washington. Write or phone Mt. Washington office for schedule and pick-up points.

On Mt. Washington, parking is available for 650 cars.

A fee will be assessed for cross-country parking.



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Mt. Washington

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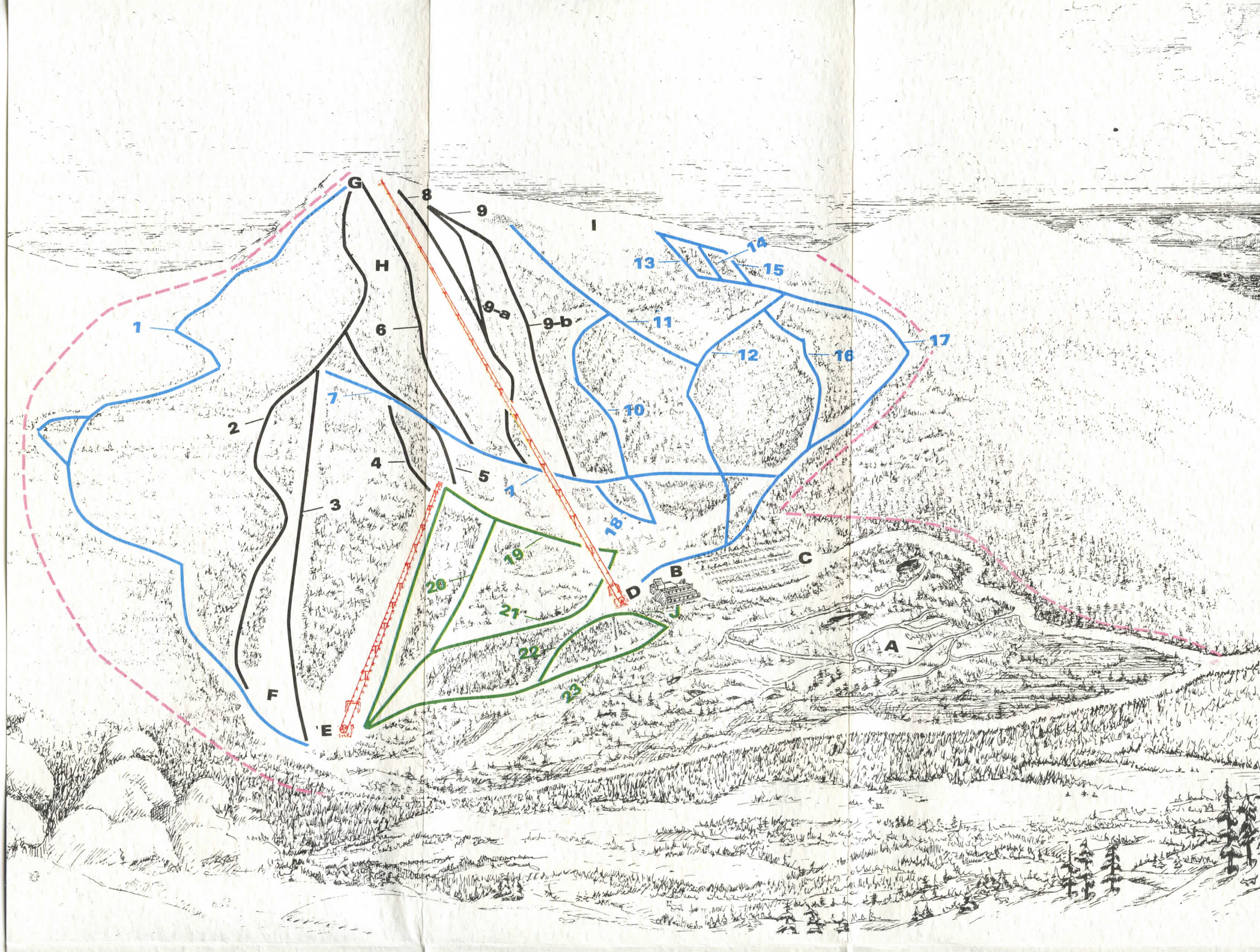
SNOW REPORT • Phone or write for further information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1625 McPhee Ave., Courtenay

Skiing boom hits Washi

Holiday crowd plugs hotels, rentals creates problems for transportation

BY BARRY ZABRACK

Mt. Washington ski area pears to have become an tant success.

A virtual skiing boom hit the mox Valley like an unexcted flash during the ristmas holidays, jamming al hotels and motels, ing up all ski rental outlets d creating long lineups at . Washington lifts.

Washington officials imate that 2,000 skiers ited the resort on the siest days of Christmas ek. Many had acnmodation in Valley hotels d motels which all reported ng completely booked with 95 per cent skiing trade.

Everything was not rosy, however. The overwhelming success packed the fleet of buses taking skiers up the hill, leaving some disgruntled visitors behind to find their own transportation.

And condition of the road up the hill has created problems with buses and other vehicles. A number of mishaps, stuck cars, road closures and blockages plagued skiers attempting to reach the top. Bus service mechanics were kept working around the clock repairing a fuel pump that was jolted loose and other minor problems.

Those that made it to the top with plans to rent skis often found them sold out by 10 a.m. on the busier days. Once word got around about the popularity of Washington, lineups for rentals began at 7 a.m.

"It looks like we're well on our way," said Washington spokesman Peter Gibson whose main task was seeing that everything went smoothly in the opening two weeks.

Like everyone else associated with the new ski resort, Gibson was somewhat surprised by the sudden influx of skiers into the area.

The main reason for the instant success of Washington appears to have been the lack of snow at other ski resorts in the province. Grouse, Seymour and Cypress Bowls in the Vancouver area were either closed or just marginally open, sending a lot of mainland skiers to Vancouver Island.

Nanaimo's Green Mountain and Arrowsmith in Port Alberni were also closed, leaving Washington as the only viable skiing operation on the Island.

Forbidden Plateau was open with marginal conditions.

"There was an excessive demand for us," commented Gibson. "We can't accommodate everyone on Washington."

The Christmas week rush created a chaotic situation for ski rentals because part of Washington's rental stock never arrived. Gibson had to scramble to find another 50 pair. The staff worked through the night when the skis finally arrived to set them up.

When the crowd arrived the next day, 400 pairs of skis were gone in two hours.

The boom also caught Hi-Lo Transportation, operators of the buses to Washington, unprepared. Wayne Heine had anticipated six per cent of the skiers using the buses, but over the Christmas week, 20 per cent wanted a ride up. Heine tried to alleviate the

Press

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problem by renting two mini-buses, and adding extra runs to the regular schedule. Even at that, some people were left behind.

"We've been swamped," said Heine.

To make matters worse, the condition of the road leading to Washington has created problems with the buses. It's been so bad the last few days, a fuel pump on one vehicle was jolted loose and other minor repairs have kept the mechanics working around the clock.

But it's also been a blessing in disguise for Heine who has seen his business soar since Washington opened.

The road has been a concern to operators of Washington who have since taken steps to improve conditions. Someone is now stationed at the bottom of the hill, checking for chains and ensuring that people going up will be able to rent equipment.

Both Heine and Gibson expect things to smooth out now that the holiday rush has ended.

"I don't think we'll ever have this problem again," said Heine.

But one woman, visiting with her two children from Nanaimo might not give them

(Continued on page 15)

Ski boom

(Continued from page 1)

the chance. She had purchased five-day lift tickets at Mt. Washington and stayed at the Sleepy Hollow motel for four days as of Dec. 29, and had not been skiing once.

Pat Eglen said she had come to the Valley expecting to use the bus service advertised in Mt. Washington brochures, but found the bus packed full each morning it arrived at her motel.

Mrs. Eglen said she was seriously considering joining with friends to rent a bus to travel to Grouse and Whistler mountains.

And the manager of the Sleepy Hollow, Mr. and Mrs. Currie, while pleased that Mt. Washington has been so successful, are worried about negative publicity circulating the down Island centres because of the busing and road condition problems.

Most of her patrons "have been having a ball" if they haven't sat in a traffic jam or had road problems or missed out on ski rentals."

"We're all inexperienced – the bus operator, the mountains, the resorts – but we don't have time to learn little by little, we have to sort it out right now...or lose business.

As for rental shortages, that problem has also been rectified said Gibson.

Many of the ski shops that normally rent equipment in Victoria and Nanaimo refused to let their stock out because of the lack of snow at all resorts except Washington. This also created a higher demand than normal, said Gibson, with 20-25 per cent of the skiers renting at the resort, a much higher percentage than anticipated. Add to that the higher sale of equipment in stores, and the subsequent shortage at retail outlets, and the problems were intensified.

APPENDIX "B"

TRAIL STANDARDS FOR COMPETITIVE CROSS-COUNTRY SKIING

F.I.S. International Ski Competition Rules

The Cross Country Course

A cross country course should be laid out so as to be a technical, tactical and physical test of the racers' qualifications. The degrees of difficulty should be in accordance with the level of the competition. The course should be laid out as naturally as possible, varying the prescribed differences in high, climbs, flat and downhill sections to avoid any monotony. Where possible the course should be laid out through woodland. The most strenuous climbs should not come in the first two or three kilometres, nor long downhill runs during the last kilometres. Rhythm should be broken as little as possible by too sudden or sharp changes of direction or by steep climbs which force the competitors to herringbone. The downhill sections must be laid out so that they can be negotiated without danger, even on a particularly fast or icy track. Changes of direction should occur before rather than at the end of downhill sections; and icy bends, sharp angles and narrow passages should be avoided.

Ladies' courses should be set with these principles especially in mind, avoiding monotonous, flat sections, and long, unbroken climbs.

In principle, the cross country course should be one-third flat, one-third uphill, one-third downhill.

The courses for WSC must be approved by the FIS Cross Country Committees. For this purpose the plans of the course must be produced in plenty of time drawn at a scale of 1:10,000. The profiles at a scale of 1:50,000 for the length; 1:5,000 for the height (i.e. multiplied 10 times) with a statement of total climb (MT), the difference in height between the highest and lowest point (HD), and the maximum climb (MM).

At WSC the courses or substantial parts of them may be run at most twice. The difficulty of the individual courses should as far as possible be as follows: the most difficult and hardest the 15 km special, then the 10 km relay race, 30 km, 15 km combined, 50 km. For ladies, then 5 km, 5 km relay race, 10 km and 20 km.

Measuring The Course

The measuring is done by tape, marking each kilometre from the Start with clearly visible boards. The differences in height must be measured as accurately as possible for the profile and for the calculation of the total climb, the differences in height and the maximum climb. These figures can be acquired from very exact maps or even more accurately, by measurement on the terrain, which is obligatory for WSC.

The Course's Length And Height Differences

The lengths of courses are:

-10 and 15 km for junior boys,
-10, 15, 30 and 50 km for men,
-5 km for junior girls,
-5, 10 and 20 km for ladies.

These are correct for WSC and, in principle, also for international races.

The difference (HD) in height between the lowest and highest points of a course may not exceed:

100 m on ladies' and junior girls' courses of 5 km
150 m on ladies' and junior boys' courses of 10 km
200 m on men's 10 km and junior 15 km courses
250 m on courses of 15 km and above, men and women.

The difference in height (MM) of any single climb, without a break of at least 200 m, - the so-called "manimum climb" - must not exceed:

50 m on junior girls' and ladies' courses of 5 km
75 m on ladies' 10 km and 20 km, and junior courses of 10 and 15 km.
100 m on men's courses.

The total climbs (MT) should not exceed:

150 - 200 m for 5 km ladies and junior girls
250 - 300 m for 10 km ladies
250 - 400 m for 10 km juniors
300 - 450 m for 10 km men and 15 km juniors
400 - 500 m for 15 km nordic-combined and 20 km ladies
450 - 600 m for 15 km men
750 - 1000 m for 30 km men
1000 - 1500 m for 50 km men

At WSC the highest point of a cross-country course may not exceed 1650 m.

Marking The Course

For marking the course, which must be done in the direction of the race, boards, arrows, flags and ribbons are used. For WSC in the following colours (or combinations in relay races):

Ladies:	5 km	blue	Men:	15 km	red
	10 km	violet	nordic-combined	15 km	green
	20 km	violet/red		30 km	red/green
3-4X	5 km	red/blue		50 km	orange
			3-4X	10 km	green/orange

The marking of the course must be so clear that the competitor is never in doubt where the track goes.

There should be kilometre signs marking the course every kilometre. The changes of direction are marked by clearly visible arrows.

Preparation Of The Course

The course should be completely prepared with machines. The snow should be prepared to a minimum width of 3 m. If two tracks are used, they should be at least 1.00-1.20 m apart, measured from the middle of the other pair. At changes of directions, mechanical trackmaking should be discontinued and racers' skating tracks allowed to develop on the turns. In special cases on downhill sections, the turns should be prepared without tracks.

Start And Finish

In the Start and Finish area there must be a temperature board showing the air and snow temperatures.

The Start and Finish should normally be on the same level, side by side. The area should be large enough to accommodate all necessary technical equipment, and for the Start and Finish tracks.

Information on Ski Competition Rules is available from: Canadian Ski Association, 333 River Rd., Tower A, Vanier, Ontario. K1L 8B9

TECHNICAL REQUIREMENTS - SUMMARY

TYPE OF TRAIL	SANCTIONED RACE	CITIZENS TOUR/RACE	RECREATIONAL TOUR
MAIN OBJECTIVE	TECHNICAL CHALLENGE	SAFETY	AESTHETIC APPEAL
LENGTH (KM)	2.5, 5, 7.5, 10, 15, 20, 30, 50	15-50 (also to 160)	INDIVID. TRAILS UP TO APPROX. 20; NETWORKS-UNLIMITED
CONFIGURATION	LOOP	LOOP OR POINT TO POINT	LOOP OR POINT TO POINT
WIDTH (M)	3.5 - 5.5	4-6 MINIMUM	CANBBE NARROWER
ELEVATION	DISTRIBUTED OVER LENGTH OF COURSE		HD 100 m on 5 km 150 m on 10 km MM 50 m on 5 km 75 m on 10 km MT 200 m on 5 km 300 m on 10 km
GRADES	15% ON SUSTAINED GR GRADES 25% ON SHORT GRADES	12% ON SUSTAINED GRADES 20% ON SHORT GRADES	10%
OBSTACLES	NOTHING TO IMPEDE FAST SKIING	NOTHING TO IMPEDE FAST SKIING	MARK WELL
TURNS	WIDE, GRADUAL, MAY NEED INWARD BANKING	WIDE, GRADUAL MAY NEED INWARD BANKING	VERY GRADUAL, GENTLE
TRACK	DOUBLE TRACKS THROUGHOUT	MAY NEED SEVERAL TRACKS	SINGLE TRACK
SIGNS	SPECIAL REQUIREMENTS FOR START & FINISH CLEARLY MARKED: DIRECTION & DISTANCE	CLEARLY MARKED: DIRECTION & DISTANCE	CLEARLY MARKED: DIRECTION & DISTANCE

APPENDIX "C"

CROSS COUNTRY SKIING IN THE COMOX VALLEY

Tired of the downhill slide, try

Cross Country

conditions here best on Coast

CROSS-country fever has struck the Comox Valley. It's no wonder.

As a lifetime recreational activity which is relatively cheap and accessible, cross-country skiing has few rivals.

The Comox Valley probably has the best conditions on the B.C. coast for the sport, with excellent snow conditions and fine undulating terrain for skiers of varying experience to enjoy.

An example of the sport's phenomenal popularity is the Vancouver Island Nordic Club's membership list. The cross-country ski club (based in the Valley) had 240 members last year, and at least 300 are anticipated this season. Nearly half the members are youngsters, indicating the sport's popularity as a family activity.

Much of the Nordic's activities are centered around the club's cabin at Paradise Meadows. The Meadows is the area's most popular and best developed country-side for the sport, and offers a challenge for the raw novice or experienced marathoner. Located just to the east of Strathcona Park, below the new Mt. Washington ski resort, the area is flat and level, and easy going.

The Nordic club has marked a number of trails through the Meadows, with a 10 kilometre medium trail leading into Strathcona Park and an easier 1 kilometre trail suited for youngsters or beginners.

The club advises against skiers leaving the Meadows and exploring other areas of Strathcona Park except with a group of experienced skiers.

The Nordic club has lessons for its members with a theory session opening the training, followed by practical experience the second day.

The club uses its own qualified skiers to teach the basics. Cost is $10 for skiers with equipment, and $16 for those requiring rentals. The club offers discount rates for rentals at a sports shop around the Comox Valley.

The CRA (Courtenay Recreation Association) is holding a ski conditioning program for $10, on Tuesday evenings.

Annual membership in the club is $7 for singles, $10 for couples, and $1 for youngsters under 16.

Two car parks are available by the Mt. Washington Ski resort, with a $3 charge per car. The parking lot is minutes away from the Meadows.

A package of lessons and equipment, totalling five three-hour sessions with skis, boots and poles for five days costs $75.50 while the price of the lessons is only $45.50.

The Forbidden Plateau ski area also offers cross-country trails, and many Nordic skiers like to discover their own favorite areas around the Comox Valley's inviting wilderness terrain.

For more information contact Forbidden Plateau at 334-4744, Mt. Washington at 338-1515 or club president Dave McQuade at 334-2332.

APPENDIX "D"

SITE PLANNING AND BASIC TRAIL STANDARDS

SITE PLANNING

Having identified the need and a potential trail program, the next steps in trail development can be undertaken. The following basic planning steps and site considerations will assist one in identifying good trail locations, layout and standards as well as minimizing maintenance costs. Furthermore, by compiling some basic information about the trail system and preparing a few simple site maps (or plans), as suggested in these steps, it should assist one in obtaining local and government support and funding, minimize vandalism and make the trail system an overall success. A well planned trail becomes a high quality trail that is well used and requires minimal maintenance over the years.

THE PLANNING STEPS

Site Selection:

In most cases the site for developing a trail system is given. It can be some vacant land around town, a municipal park, a golf course, an environmental or forest reserve, a farm, crown land, or other suitable open space. The key factors to consider in selecting a suitable site include:

a) adequate snow cover (7-10 cm)
b) rolling topography
c) interesting landscape with views and vistas
d) good access
e) exposure to sun and weather conditions

Trail Route Selection:

Using existing topographical maps (1:15,000 minimum, if available) and aerial photographs (1:50,000 minimum scale) plot out a rough trail plan based on general knowledge of the area. Include not only the trails but probable places for parking, rest shelters and sanitation facilities (doing some pre-planning on maps/ air photos can save time for future site inspections and can better prepare one for what to expect at that site).

Site Inspection:

When a route has been plotted on a map, go to the site and walk it for a more detailed analysis of trail location. At this stage, mark the trail using coloured surveyor's tape tied to trees, shrubs or stakes. (Note: if maps/photos are not available, the above step can be omitted and site inspection can take place immediately.)

When marking the trail on-site, keep in mind the following points to ensure good layout:

a) Try to have the trail route in a ratio of 1/3 over flat ground, 1/3 downhill and 1/3 uphill.
b) Avoid **steep slopes**, especially on down runs, unless there is sufficient run-out space provided at the bottom (3-5 times longer than height of hill) or it is in an advanced trail and clearly marked as such.

c) Remember **north** slopes retain snow longer, **south** slopes lose snow faster (however, south slopes are generally more pleasant and provide better exposure for skiing) — **south** slopes through trees using **well packed** trails provide a good compromise. (Refer to Trail Maintenance Section).

d) Sharp **dips and turns** in the trail should be avoided as they can be hazardous to the skier and pose problems during trail construction and maintenance.

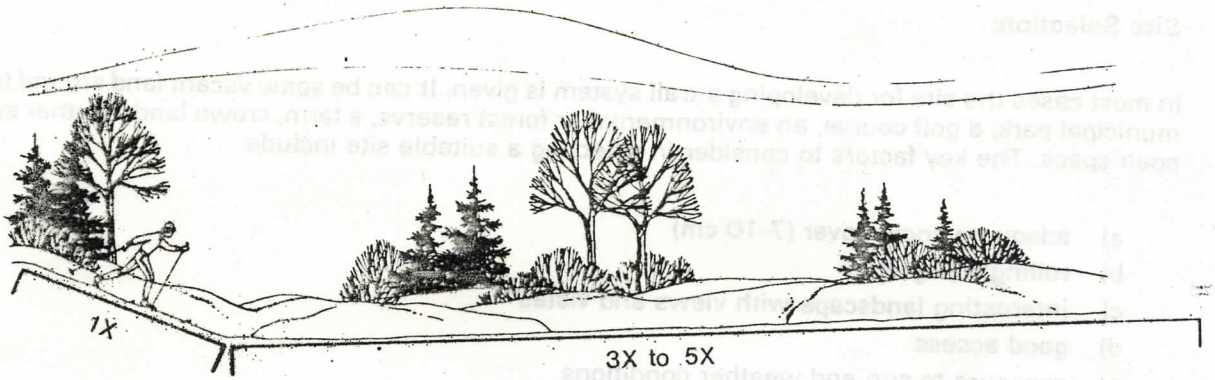
e) **Stream crossings** should be bridged, especially if water still flows in the winter.

f) When the trail **traverses** a hill, avoid **steep angles on cross slopes** so that skis don't slip out of track when crossing.

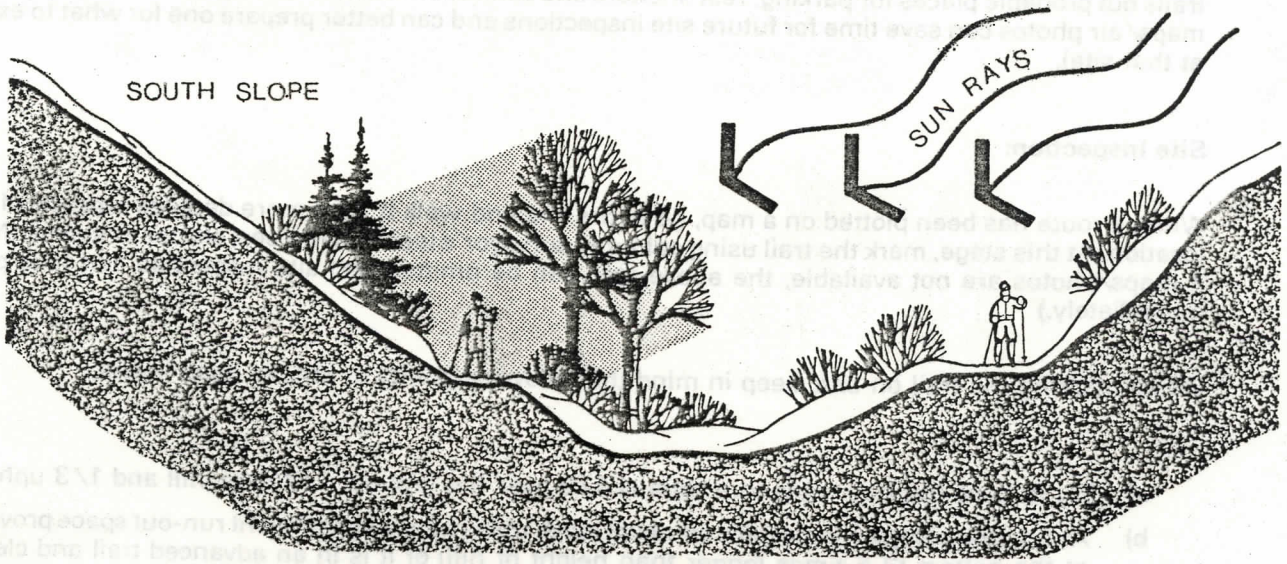
g) Trails should be located away from **prevailing winds** for the comfort of the skiers and to reduce drifting and wind packing of snow.

h) Try to include lots of **views and vistas** of the surrounding landscape by bringing the trail from low enclosed areas to high open look-outs. This provides variety and adds to the overall "trail experience" that the skier is looking for.

i) Avoid dense coniferous stands, as snow conditions underneath may not be sufficient for proper trail use.



B. — AVOID STEEP SLOPES



C. — NORTH SLOPES RETAIN SNOW LONGER

RATING TRAILS FOR DEGREES OF DIFFICULTY

To ensure the safety of skiers, trails should be marked to indicate the degree of expertise required. The base loop of a trail system should be suitable for novices, while secondary loops can be used to provide conditions suitable for more experienced skiers. The following identifies more specifically the types of conditions required by different types of skiers.

Novice:

Downhill runs should have a maximum grade of 10 percent. Trails crossing slopes diagonally should be wide and gentle. Several short slopes are preferable to long slopes. With short slopes, speeds do not become too great and climbing is not tiresome. Descents with steep side slopes are difficult for inexperienced skiers and should be avoided.

Remember to include flat, open areas where beginners can practice techniques.

Intermediate:

Maximum grade for downhill slopes should be 25 percent. Curves may be sharp, but ample room should be left for "over-shooting". Up to one third of the trail may be uphill with some steep, but short, climbs.

Expert:

Maximum grade for downhill slopes should be 40 percent. Gentler grades should be used on long runs where the trail surface is rough or where there are sharp curves. Adequate 'runout' distance should be provided at the bottom of steep or long slopes. Up to one half of the trail may be uphill.

Note

Trails should be rated based on the most difficult point along a certain route. An expert trail may be skiable by a beginner especially over flat terrain; but if there is even one steep slope on the route it should be designated as an **expert** or **advanced** run at the trailhead, so that beginners do not end up getting stranded far down the trail.

Racing Trail:

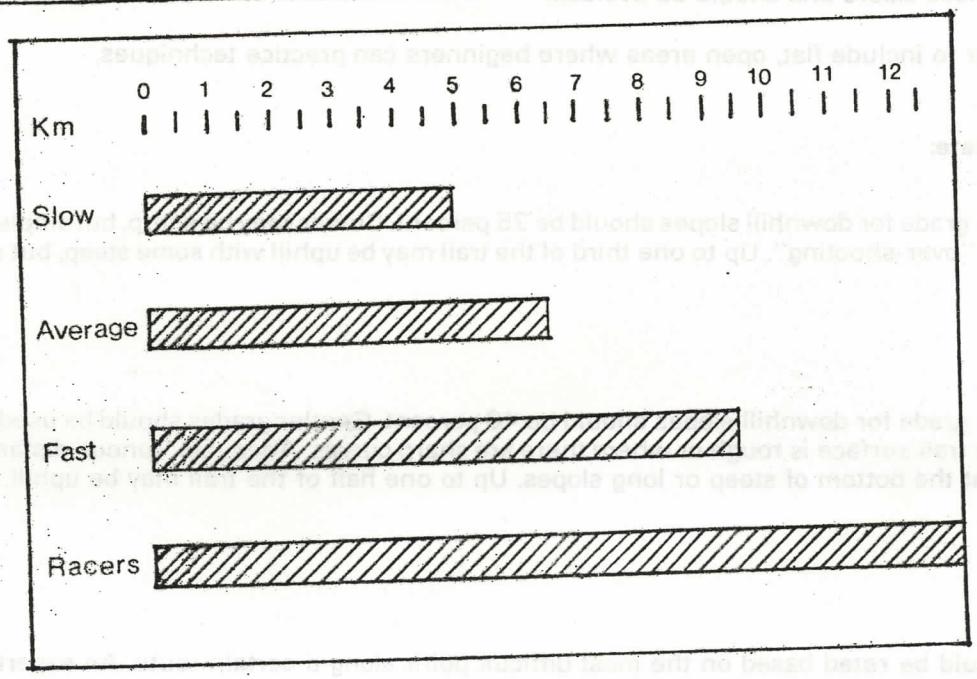
As stated in the program section, racers require certain standards. If you are interested in setting up a race course and holding "official races" get in touch with the Canadian Ski Association, Nordic Division, to obtain exact requirements and direction. (Refer to section "Additional Sources").

BASIC TRAIL STANDARDS

TRAIL LENGTH

Listed below are recorded average distances covered in an hour by various categories of skiers. These distances can be used as a basis for calculating trail length. (Canadian Ski Marathon, Quebec, 1972.)

CATEGORIES OF SKIERS/AVERAGE DISTANCE COVERED



Slow tourers	4-5 km/h
Average tourers	5-5.6 km/h
Fast tourers	8-9.5 km/h
Racers	9.5-13 km/h

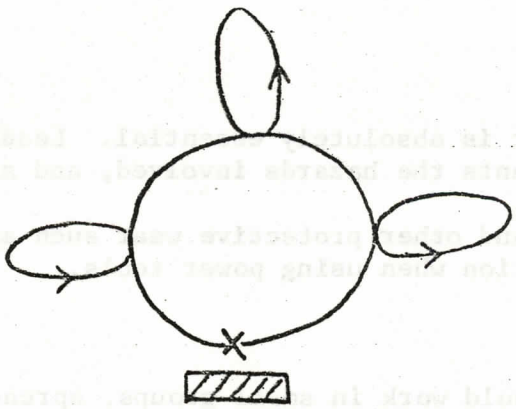
Short loops around a central staging area (ie: lodge) should be provided for partial day-use and for use by slow and novice skiers. Working from the above figures, and assuming that some novices will be slower than slow tourers, base loops should be between 3-5 km.

For full day-use, a minimum distance of 15 to 20 km is recommended. The maximum distance depends upon the class of skier. For average tourers 22 km will probably be adequate (four hours skiing at 5.5 km/h); for fast tourers 36 km, (four hours skiing at 9.0 km/h).

Total length for a trail system will depend on how many alternative loops can be provided on the land that is available and the type of terrain that is to be crossed.

APPENDIX "E"

TRAIL CONSTRUCTION TECHNIQUES



3. Satellite Loop

A wide range of alternatives each with its own characteristics. Some loops could have more use, some offering more solitude.

Building the Trail

Construction techniques for ski touring will vary throughout the province. In heavily forested areas, trails should be a minimum width of 5 m. This allows for snow to fall down and provides the necessary area needed to avoid snow cavities and snow drop from branches. Clearing should include inside limbing of trees to about 3 m. above average snow depth. The understorey vegetation should be cleared but the root system and ground surface should not be disturbed in order to minimize erosion.

Actual trail clearing should not be started until the route has been firmly established and temporarily marked throughout its entire length and approved in writing by the administering government agency.

1. Tools required: Hatchets, saws, axes, power saws, clippers (long-handled preferably), mattocks, hammers (for nailing markers on trees)* brush cutters.

   *Some people prefer to use the back of a hatchet for this purpose since the hatchet can also be used for removing small branches which may obscure the marker (thus enabling one to do two things with one tool).

2. All tools should be sharp and in first-class condition. Extra saw blades for Swede saws, and files for sharpening tools during the work, should be carried.

3. The power saw requires extra gas (mixed with oil), extra oil for the chain, tools to tighten the chain, and a round file for sharpening the teeth.

4. First Aid kit is absolutely essential. Leaders must impress upon all participants the hazards involved, and ask them to use extra care.

5. Work gloves and other protective wear such as hard hat, face and ear sound protection when using power tools.

Method of Working

1. The party should work in small groups, spread out along the marked route, and working carefully from one marker to the next. If everyone works in the same spot, there is more risk of injury.

2. Emphasis should be on thorough work, not on speed, even if this means coming back to finish the job.

3. When clearing through a heavily treed area the tendency is to use open patches to avoid unnecessary tree cutting and ensure good snow cover, entering the heavy trees only to join open sections or to maintain direction or desired profile. As these open patches receive more sunlight the amount of undergrowth is far more dense. In clearing this type of terrain it is recommended that the undergrowth be cleared first to beyond the maximum width of the trail. The removal of undergrowth will allow for safe and easy movement when felling and limbing of larger trees. Avoid cutting a number of trees without clearing under growth and limbs as this makes a real jungle which is very difficult to clear up afterwards.

4. Fallen branches, trees and rocks have to be picked up and placed carefully along the lower side of the trail; on a slope, this will stop sliding earth and foliage, and will eventually help to build up a shelf-like formation along which the trail will run. Do not just throw everything haphazardly all over the place; make use of it!

5. Mattocks should be used wherever necessary to carve out the slope, pulling the earth down onto the previously placed branches and trees, and achieving the same shelf-like effect.

6. In extremely steep sections, a long tree trunk can be wedged, parallel to the edge of the trail, against two standing trees, and the gap between trunk and slope filled in with small branches, rocks and earth - again achieving a "shelf" for the trail.

Right of Way Clearing

For main trails where intensive use is expected, there should be enough room for two or three sets of tracks. The minimum width for two tracks is 3 m. and for three tracks 4 m. For single tracks width of 2.5 m. is recommended.

Clearing height should be 2.5 m. plus the maximum snow depth expected. Where branches are likely to droop under the weight of snow or ice, extra room should be provided.

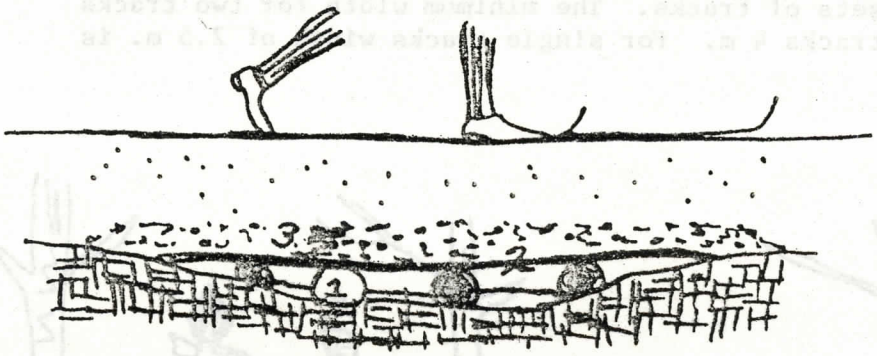
Technical Aspects of Trail Building

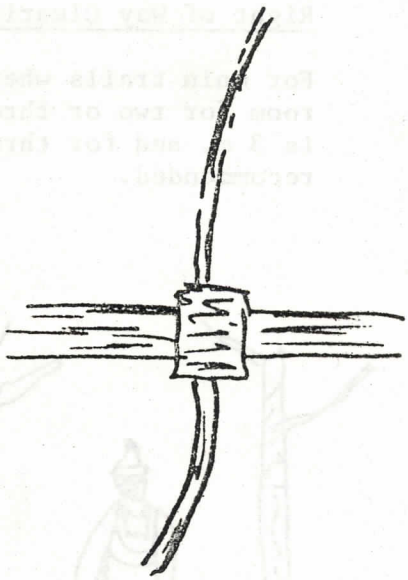
Small streams which freeze solidly can be crossed without bridging; however, if bridges are installed the trail season can be extended.

Bridges should be wide enough for track and poles. Railings should be included on narrow bridges which are of sufficient height to be dangerous. Bridges should be strong enough to support trail grooming equipment.

For shallow streams where bridges are not required during other seasons, brush fill crossings can be used. Piles of brush are stocked across streams in late autumn. These must be thick enough to ensure that the snow layer will be well above the water level. Bridges should not be located at bottom of downhill runs and approaches should be reasonably straight and level.

Brush Bridge





1. Logs laid parallel to direction of waterflow.
2. Saplings laid at right angles over logs.
3. Brush laid at right angles over samplings.

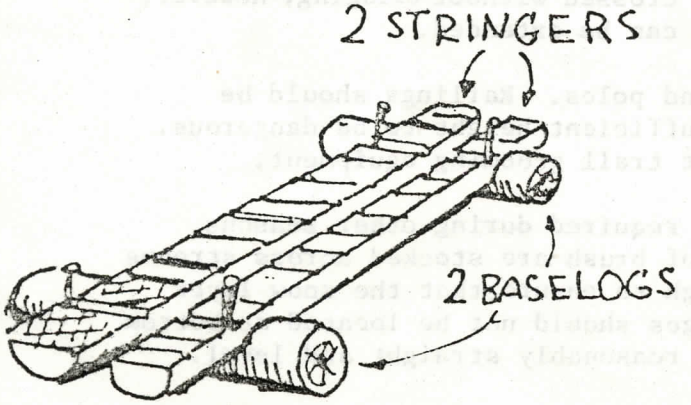
Plan View

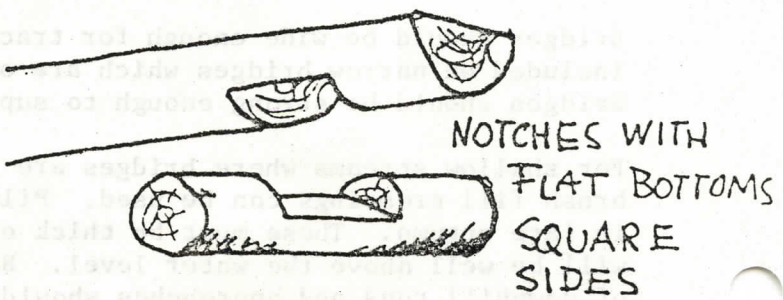
Bridges

Bridges constructed of native materials provide a simple and effective method to deal with erosion and vegetation damage in wet or boggy sections of trail. These bridges can also be used to ford small streams and gullies.

1. Select trees that are straight and most uniform in diameter and with the least amount of branches. Logs must be peeled.

2. If the log is more than 12" in diameter at its thinner end, one single stringer is sufficient. Otherwise, two stringers have to be used side by side. The corresponding notches have to be cut in such a way that their sides, rather than the bottoms are touching. This will ensure snug fit and will prevent rocking of the stringers sidewise.

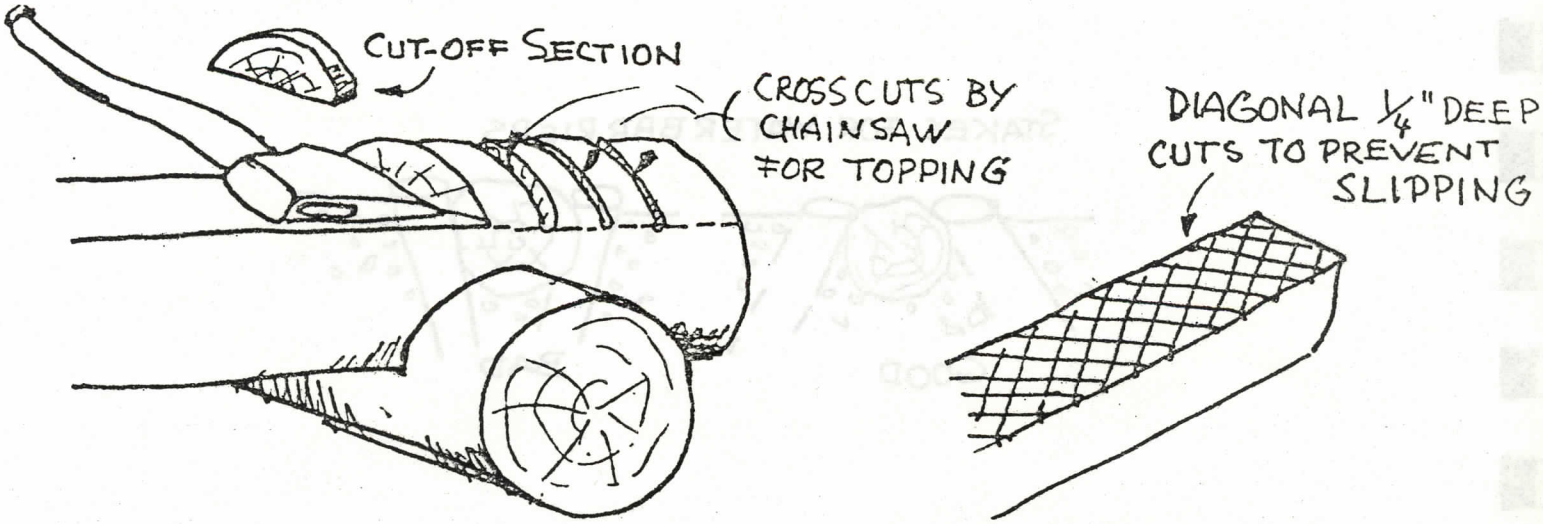




3. Make the base logs longer if the mud is very deep.

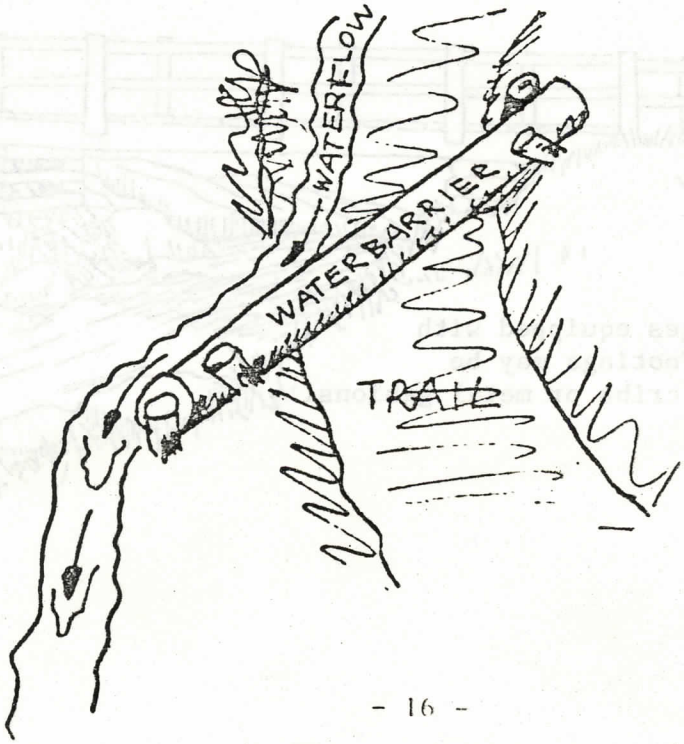
4. Topping is best done by making cross-cuts with the chain saw, two inches apart, then cutting off the sections with an axe or a mattock. Very effective are diagonal cross-cuts 1/4" deep over the flat surface of the topped log to prevent slipping.

5. Rocks or stable soil should be used at each end of the bridge.

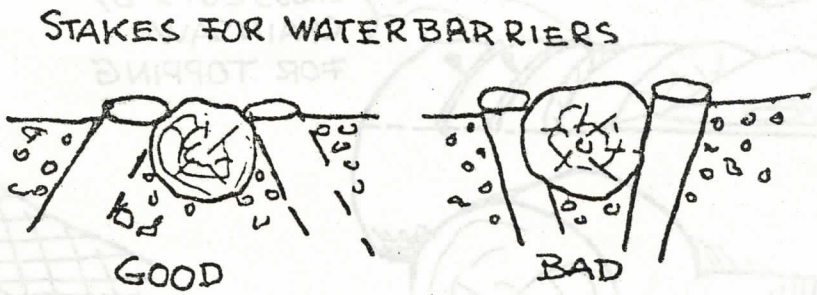


Waterbars are an effective way to deal with water run-off on steep slopes with unstable soil.

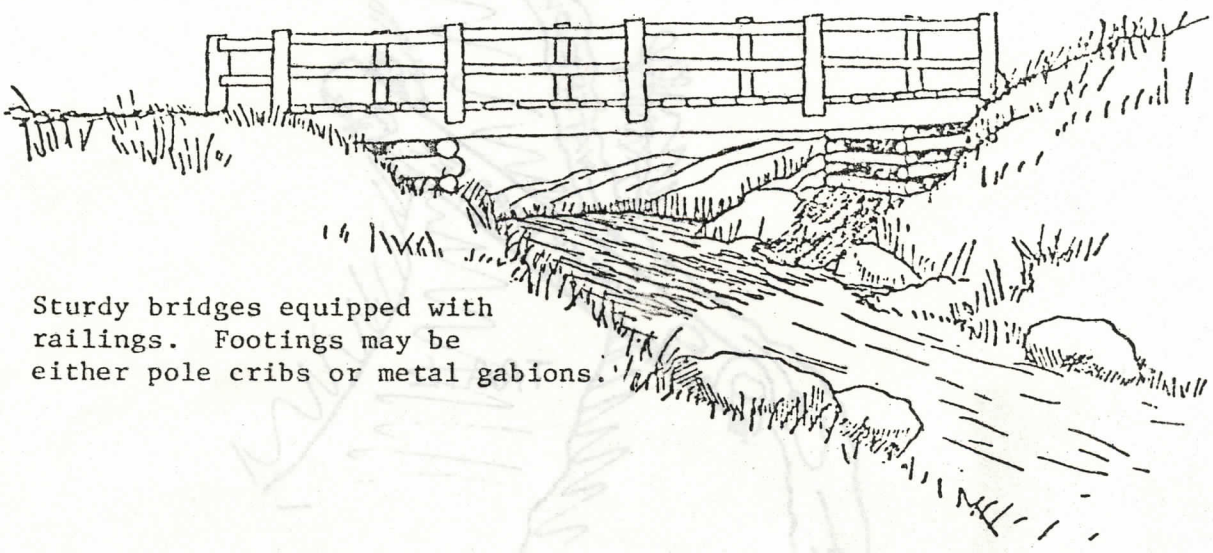
6. The diameter of a waterbar should be at least 5" to 6". It should extend to the outside edge of the treadway on both sides.



7. Dig a ditch 5" to 6" deep on the uphill side of the bar to lead the water. The stakes to hold the bar should be driven in at an angle to form an inverted "V" over the bar. Cut them flush with the bar.



Bridges



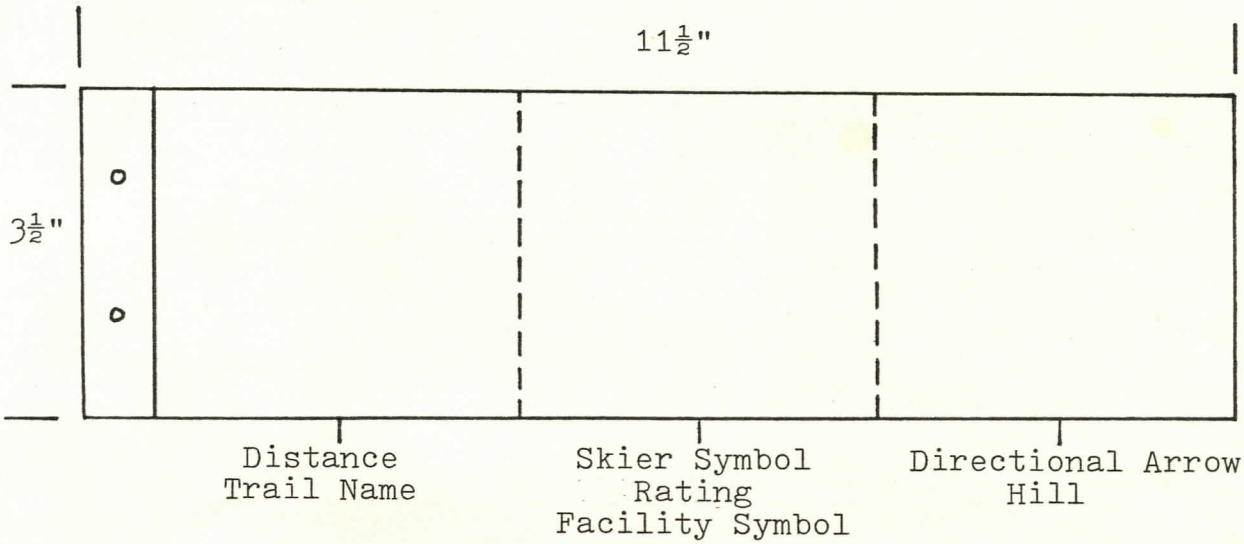
Sturdy bridges equipped with railings. Footings may be either pole cribs or metal gabions.

CROSS COUNTRY SKI SIGN SYSTEM

Here is a cross country sign system that is flexible. It meets the needs of trails ranging from wilderness routes to highly groomed racing circuits. It has the capacity to provide information about the following subjects:

1. trailway location
2. trail identification (name)
3. hills
4. turns
5. distance marking (elapsed distance from start)
6. facility location and identification (washrooms, warm-up hut)

The system can be expanded easily to fulfill additional functions.



PLACEMENT OF SYMBOLS ON SIGN BLANKS

Mapping

Every trail and trail system should have a map which contains the following information:

a) Map of the trail itself, with an inset map which provides regional context;

b) Identifies all access points and orientation points to the trail;

c) Classifies the trail as to its designed purpose or activity(ies);

d) Rates the trail as to degree of difficulty;

e) States trail length either in miles or time required to complete a circuit;

f) Identifies all potential hazards as well as points of interest along the route;

g) Gives address to write for further information on trails in the vicinity.

The following maps are examples of good cross-country map illustration.

Waterproofing Maps

Your trail maps may be produced on a waterproof paper stock (Tyvek-Coast Paper) contact Sport B.C. Print Shop, 1200 Hornby St., Vancouver, for further information.

The following maps are examples of good cross country map illustration:

APPENDIX "F"

BRIDGE BUILDING PROCEDURE

Bridges should be constructed during late summer or fall when the stream banks are dry and stable. Care must be taken to record the spring high water mark and build the bridge at least 1 - 2 feet above that mark.

Every bridge section longer than 15 feet should be supported by a crib or gabion.

Following construction, landscape both approaches to restore the area as closely as possible to its former condition. Wood chips can be used if the site is either soft or wet.

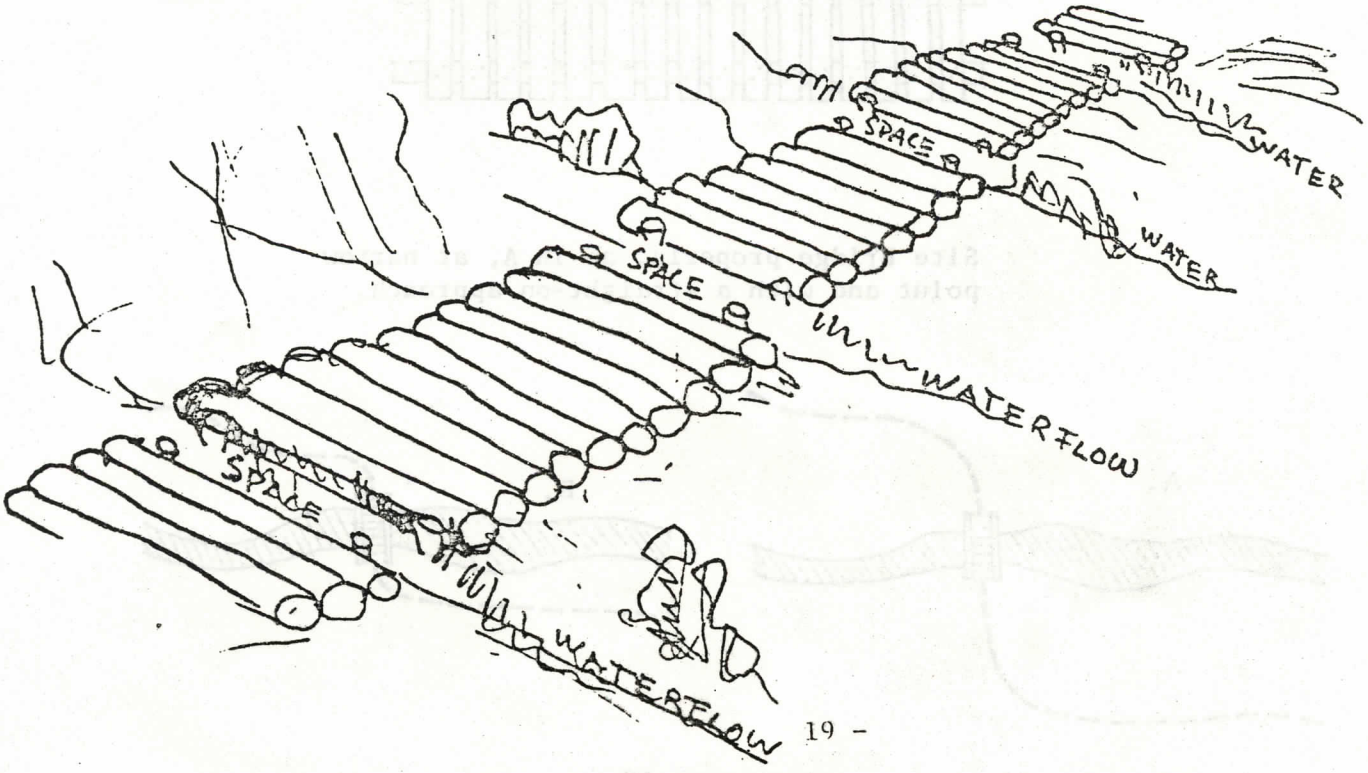
Components

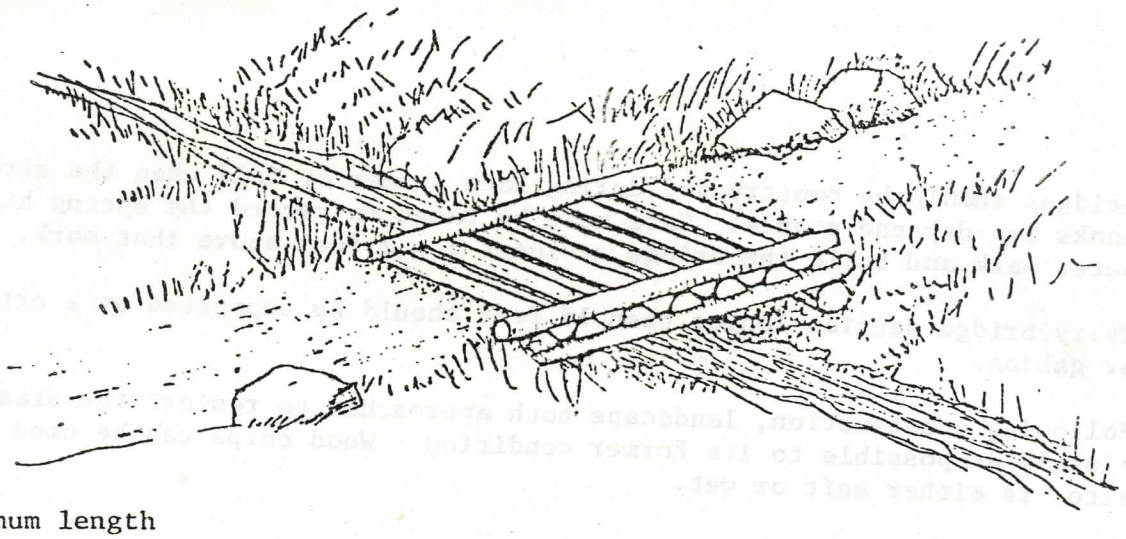
a. Foundation - This can be a log crib or gabion (wire basket filled with stones), or even simpler, a log resting on the ground on either stream bank. Its purpose is to support the superstructure and keep it as dry as possible.

b. Stringers - Stringers (2 or more) span the stream or chasm, resting on the foundation. If logs are used, they must be peeled. The bridge deck is mounted onto the stringers.

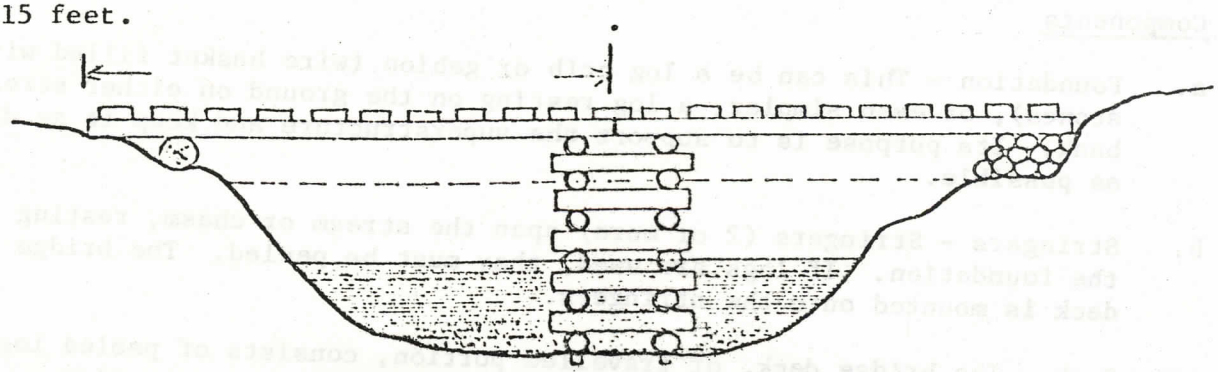
c. Deck - The bridge deck, or travelled portion, consists of peeled log or rough-sawn lumber arranged either longitudinally or cross-wise. The decking should be solid for winter trails to retain snow cover. All wooden bridge components must be treated with wood preservative.

When cordwooding technique rather than bridges are used over bogs, it is important that the logs are placed in such a way that the water has a run-off. Make each section 5 to 8 feet long. Then use a space of 6" to 8" before placing the next section. Logs should be at least 5" in diameter.

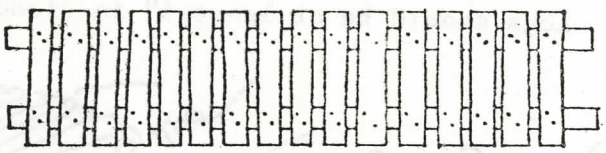




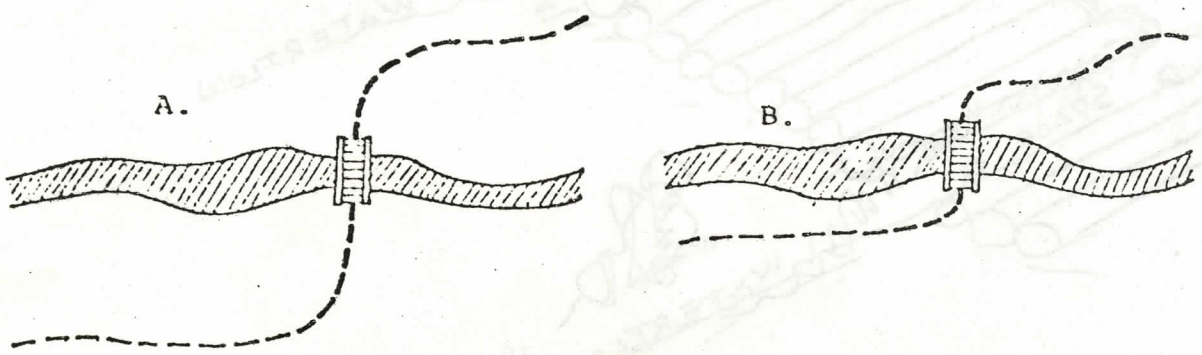
Maximum length
15 feet.



Cross sectional and plan views of bridge construction. Footing may be a log, stones, pole crib or gabion.



Site bridge properly, as in A, at narrow point and with a straight-on approach.



Fall and de-limb trees

to facilitate a minimum bridge

width of 1.5 metres.

Secure the logs from rolling by placing a stabilizing peg beside the outer log.

Saw off the end of each log at an angle of approximate ly 30°. The bridge is completed.

APPENDIX "G"

SKI TOURING TRAIL PLANNER - COSTING

difficult to use and difficult to manage. I feel a good signing system consists of basically three elements:

a) Trailhead Sign giving information as to where trail(s) go, rest stops, rest rooms, etc. This will be the most expensive sign costing perhaps $100.00. This cost is fixed regardless of trail distance.

b) Informational and Directional Signs on trails showing distance to rest stops, direction at trail junctions, etc., will probably require an average of about -- 1/mile at cost of about $10.00 each giving cost of about $10.00/mile.

c) Trail Markers - Any time the trail is not well defined by vegetation or other natural markers, trail markers should be installed at frequent intervals. We used four-foot lath with a strip of red or yellow plastic tape tied to the top. Installed at a rate of 100 per mile, the cost per mile would be approximately $2.00/mile.

d) Total Sign Cost:

Trail Head Sign	$100.00
Informational & Directional, plus Trail Markers	12.00/mile

III. Grooming

If a trail is properly laid out snow grooming will not be needed. The snow on trails laid out in the woods or at the base of hills out of the wind will tend to stay fluffy and will not need grooming. Trails laid out on open wind-swept slopes will get very icy and require frequent grooming. The only maintenance necessary on a well planned trail will be the setting of a new track after a heavy snowfall. Most light snowfalls will not obliterate the old track and there is no reason to reset it. The best way to reset the track is simply to ski it. This is not necessarily an undesirable task especially if the park manager happens to be a ski tourer.

Cost:	.3 hours/mile at $5.00/hour	= $1.65/mile
	x 3 heavy snows	= $4.95/mile

IV. Auxiliary Facilities

In our case, most needed auxiliary facilities such as parking lots, rest stops, latrines, picnic tables, etc., already exist as part of the summer facilities. The use season on these facilities is merely extended into the winter. Costs on miscellaneous items such as small bridges (4-2 x 4 stringers under 4 x 8 x 3/4" plywood), warming stoves, firewood, etc., probably amount to about $200.00/trail system.

V. Total Trail Costs

For the purpose of simplicity, let's base estimated total costs for establishing and maintaining a ski touring trail on a ten-mile system containing a 4-mile short loop and a 6-mile long loop. For this system the approximate costs would be:

A.	Clearing and mowing $71.00/mile x 10	= $ 710.00
B.	Signing	
	1. Trailhead sign 100.00 plus	
	2. Information & Directional Signs @ $12.00/mile x 10 = $120.00	
	Total	= 220.00
C.	Grooming $.95/mile x 10	= 49.50
D.	Auxiliary facilities	= 200.00
E.	Total estimated cost	= $1179.50
	or say $1200.00	

These costs can of course be greatly offset if ski touring trails can be established on existing hiking, biking or horse trails. It must be remembered, however, that the criteria for ski touring trails (number of turns, sharpness of turns, steepness of hills, length, etc.) may be different than for these other activities. It would be desirable to contact an accomplished ski tourer or touring club (North Star) for help and guidance in laying out trails.

Few if any other sports can be provided for with the small outlay of money required for ski touring. Couple this with the fact that ski touring is the fastest growing winter sport in North America (soon to bypass Alpine skiing in number of participants) and I think all would have to agree that any money spent in providing for ski touring would be an excellent investment.

February 25, 1972

By: E. Sorgatz

C - On-Site Planning

Walk the route planned on the map, checking for slope angles, sun and wind exposure, drainage, ease of trail clearing, etc. Adjust plans to fit the realities of the terrain. Mark trail with colored tapes tied on trees, shrubs and stakes.

D - Organization and Budgeting

Consider costs of trail clearing and construction of needed facilities. Set up a timetable for clearing, construction and signing, keeping in mind the probable dates of first snowfall. Establish responsibility for achieving timetable.

E - Trail Building

Actual trail building activities should be broken down into three major areas:

1 - Clearing -- removal of shrubs, trees, windfalls, rocks, etc., according to trail specifications.

2 - Construction -- building of bridges, rest areas, shelters* and picnic tables, trail registers, litter pickup points and sanitation facilities*.

3 - Signing -- planning, making and placing of trailhead and on-trail signs, road crossing signs, etc.

* As trails tend to evolve rapidly during the first few years of use, construction of major facilities such as shelters and toilets should be limited to areas where you are certain the trail route will not change.

APPENDIX

HENNEPTIN COUNTY PARK RESERVE DISTRICT

ESTIMATE OF COSTS INVOLVED IN
ESTABLISHING & MAINTAINING SKI TOURING TRAILS

NOTE: Keep in mind that this is one example. Conditions will vary considerably. Volunteer workers can reduce cost substantially.

In 1971 the Hennepin County Park Reserve District established ski touring trails in four of its park reserves. Very minimal efforts in the way of promotion, publicity and advertising attracted several thousand people in the winter of '71-72. Because of the compatibility of this form of recreation with the goals and purposes of the Hennepin County Park Reserve District, it will be actively promoted in the winter of 1972-73. We will be gearing for an estimated 10,000 users in the winter of '72-73. Trail preparation, signing, program development, etc., will begin in the summer of '72.

What does it cost to establish and maintain ski touring trails? Although costs will vary depending upon local conditions, the following estimates, based on our experiences during the winter of 1971-72, could be used as a rough guideline in estimating costs.

I. Clearing and Mowing

The width of our trails was determined by the width of the mower used in mowing the trail. (We find it desirable to mow our trails prior to the first snow. Mowed trails collect and hold more snow than when unmowed.) A Woods 80" mower was used. At a width of 80" we found little need for actually cutting down trees. In most cases the trail could be wound around trees. The majority of time spent in clearing was devoted to removal of logs, rocks and large brush. Weeds, small brush, etc., was left standing in the initial clearing procedure and mowed down later. Total estimate of dollars spent in clearing and mowing trails:

Time - 16 man hours/mile x $4.00/hr. =	$64.00/mile
Equipment - Tractor + mower - 2 hours/mile x $3.50/hr. =	7.00/mile
Materials - None	
Total estimated dollars involved in clearing and mowing:	$71.00/mile

II. Signing

Signing is perhaps the most important step in establishing a good ski touring trail. Without good signing the trail will be both

APPENDIX "H"

SOURCES FOR FUNDING TRAIL WORK

SOURCES FOR FUNDING TRAILWORK

To commence work on that new cross-country trail, you will require funding either from private source or government.

Private

Perhaps a local merchant or merchants, bank or other private sources would be interested in sponsoring your project for the community cross-country trail. Try approaching them after you have detailed your plans.

Government - Federal

"Canada Works and Young Canada Works" programs are administered by the Federal Department of Manpower and Immigration, designed to utilize the expertise of local organizations in the development and management of projects that will create new short term employment. Associations and clubs that have been in existence for at least six months are eligible to apply for funding for a minimum of three workers plus material costs. Young Canada Works summer programs are available for students and year round Canada Works grants are for unemployed individuals. Deadlines for applications are: Canada Works - end of January, end of August. Young Canada Works - end of January. For detailed information on the grants available under this program and application forms, contact your local Manpower & Immigration office.

Government - Provincial

"Youth Employment Program". This grant is offered by the Ministry of Labour and is designed to provide youth with opportunities to develop skills which will assist them in entering the work force and contribute to the social and economic development of the Province by creating employment opportunities. Non-profit organizations may apply for funding for up to five positions per project during the period May 1 to August 31. To apply contact: Employment Opportunity Program, Ministry of Labour, Province of B.C., 4946 Canada Way, Burnaby B.C. V5G 4J6.

Government - Provincial

Public Recreational Facilities Fund, B.C. Recreation and Fitness Branch. This is funding to assist communities in developing recreation facilities. Municipalities and Regional Districts are eligible and consideration will be given to projects sponsored by registered societies or co-sponsored by a municipality and the private sector or regional district and the private sector, provided that:

a) the facility satisfies a demonstrated public need
b) The recipient guarantees general public access and that
c) the security of the provincial investment of public funds is assured.

The type of programs eligible are:

a) Renovations to facilities
b) Additions to facilities
c) Construction of new facilities

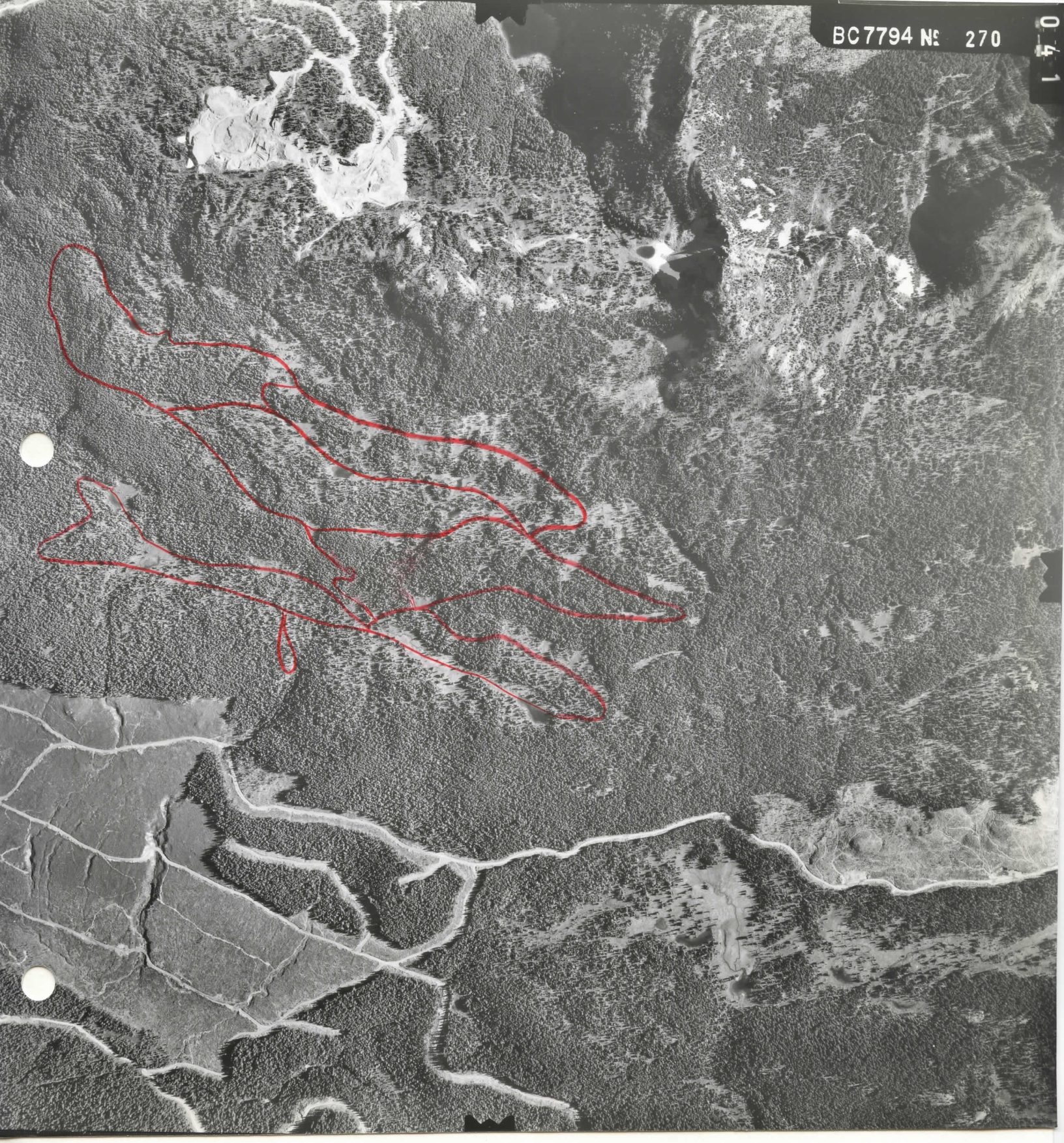
d) Additional or replacement of major equipment in existing facilities. Land cost will not be considered as part of the eligible capital cost. Facilities should be oriented towards the beneficial participation of the user, rather than the advancement of the activity and creation of facilities suitable for family participation. To apply, a brief application form supplying essential data in regards to the project and its sponsoring agency should be sent to the Recreation & Fitness Branch. However, if your community is considering the development of a recreational facility and requires information on available support services, guidelines, application forms or master plan procedures, please contact the:

Recreation Facilities Assistance Program
Recreation & Fitness Branch
Ministry of Provincial Secretary & Government Service
Legislative Buildings
Victoria B.C. V8V 1X4

APPENDIX "I"

AERIAL PHOTO STEREOPAIRS

Flight Line B.C. 7794, photos no. 269, 270, 271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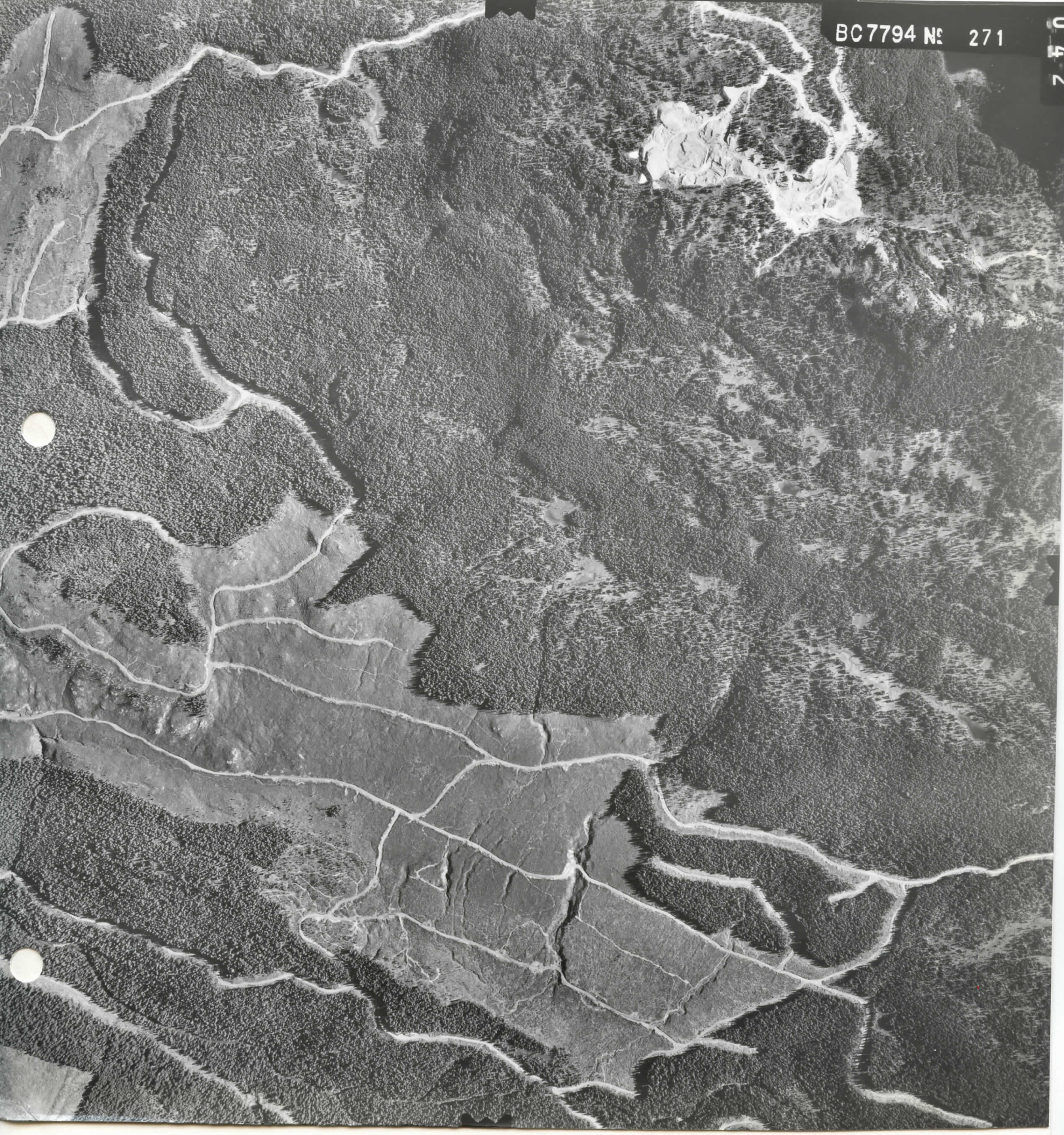
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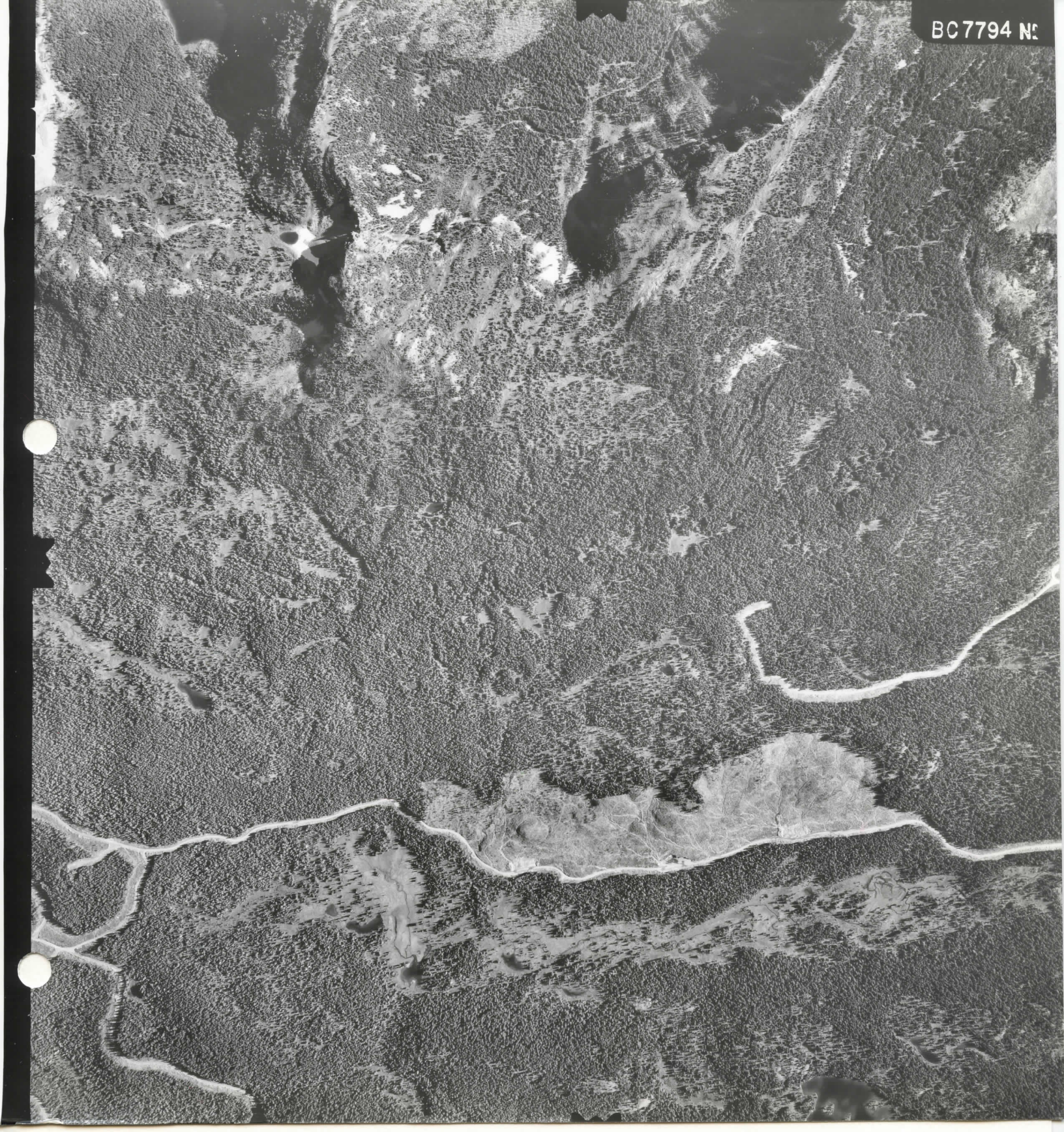
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APPENDIX "J"

TRACKSETTERS

TRAIL GROOMING

A well maintained cross country ski trail is a high-use recreational facility. Trail condition and marking should be checked periodically, especially after every snowfall. This makes trail location easy even when old ski tracks have been covered by new snow.

Trail grooming involves packing newly fallen snow and bettering poor trail conditions, such as hard pack and ice, by breaking up the hard surface. The amount of grooming necessary increases with the number of skiers using the trails. After considerable use, trails become hardpacked and often rutted when wet snow freezes. This makes control difficult and skiing tedious, especially on hills.

Track setting involves producing a set or sets of two ski tracks, spaced six inches apart about two inches deep and about three inches wide, which are good dimensions for skis to follow.

Grooming and track setting can be done either manually or mechanically.

MANUAL GROOMING AND TRACK SETTING are effective only in soft snow conditions. Snowshoes are used for packing and smoothing the surface, and skis are used for setting the tracks. But if the surface is too hard, neither grooming nor track setting can be done manually.

Snowshoe packing is time-consuming work. It requires four persons walking the trail side by side at least twice. This is necessary to assure that the tracks will be firm enough to resist breaking down with repeated use. Manual track setting is best done in the late afternoon so that the tracks will freeze-in with the lower temperatures of the night. This is known as letting the tracks 'set up'.

To set a good durable track requires about 10 skiers following each other in the same set of tracks or fewer skiers going over the tracks several times. The lead skier in the group setting the tracks must keep his skis straight and at a constant spacing of six inches. The skiers following ski in the leader's tracks.

MECHANICAL GROOMING AND TRACK SETTING is far more efficient and can handle many jobs not possible using traditional manual methods. The only requirements for the use of mechanical equipment are that the trails be wide enough to allow passage, and that the terrain not be so severe as to prevent the use of snow vehicles involved. Narrow bridges, deep depressions, unsafe ice over water, and steep hills hinder or prevent the use of such equipment. Trails should be designed to allow for the use of mechanical devices expected to be used.

Packing a trail with a snowmobile is easy, but there are a few tricks to producing the desired smooth trail. First, packing cannot be done well at high speeds because snowmobiles lose directional control as speed increases. Second, pack in several passes. Start by packing the extreme side of the trail and work towards the opposite side with each pass. Packing an entire trail width once is usually adequate. But if it must be done again to insure a firm surface, wait until the entire width of the trail has been done once, then start again. Any snowmobile can be used for packing, the heavier machines setting a firmer base.

The machine must be kept flat at all times or the treads will angle into the snow and leave a ditch which must be filled in before it freezes into place. On traverses, pack flat by angling the machine into the hill: stand with both feet on the uphill side of the snowmobile and lean uphill. This creates a flat trail shelf. On extra steep hills, it's sometimes necessary to shovel snow to the low side of traverses to build the trail up and make it flat. This should be done before packing. If shelfing on traverses is done once early in the season, it should not have to be repeated, provided that the trail is kept packed.

Knowing when to pack is important. For instance, wet snow should not be packed if the temperature is expected to drop below freezing, because an unskiable frozen surface will result. When left alone, the wet snow will dry out with the drop to below freezing temperatures, resulting in loose granular, almost powder like snow, which is easily groomed after the freeze. Packing may be necessary several times during a heavy snow storm; otherwise so much snow will accumulate that you will not be able to keep the snowmobile flat. Keeping the machine flat while packing deep snow requires low speeds and a constant shifting of body weight. It is easier to begin packing after six inches of snow have fallen, and repeat each time that much snow accumulates.

Tracks may be set on packed trails when there is adequate cover to drag a track sled without having to worry about hitting stumps or rocks under the snow. Basically, all track sleds work in the same manner. There are two three-inch wide cutting blades set six inches apart which are mounted to a sled and pulled through the snow. The upper section of the blade is one inch wider than the lower section to allow for passage of the binding and ski boot. These blades carve two tracks through the snow about two to three inches deep. Track sleds must be heavy enough so that the cutting blades will dig into the packed snow surface. Areas that have hard snow conditions should check to be sure sleds they purchase or make will cut tracks in the prevailing conditions. Track sleds must also have lateral stability when pulled, to assure that they set straight tracks. This is especially important when going downhill.

Before setting tracks, choose a route that will prevent going over the same set of tracks twice. Parallel sets of tracks are useful wherever the trail is wide enough. On hills where skiers are likely to snowplow to maintain control, keep the track as far to the side as safely possible; otherwise, it will be eradicated after two or three skiers snowplow over it. Set two tracks on hills, one for going up and one for coming down.

Tracks should always be set with enough room on both sides for poling without hitting brush or trees, or interfering with other skiers. This is especially important for races. Setting speed should be low enough that the tracks are deep enough and do not fill in with snow thrown back by the sled. On downhill runs, speed should be low to prevent snow from coming off the sled and rolling into and filling the tracks. Do not set tracks on steep hills on touring trails if they will present control problems for skiers descending. Increased speed going uphill is usually necessary to keep the snowmobile from bogging down. If the machine does bog down, it will dig a hole which must be filled before the track can be reset from the bottom. If possible, set tracks going down the steeper hills and such problems will be avoided.

When tracks have been skied out or become iced, and when trails are packed hard or snow has melted and refrozen solid, control of skis is difficult and it's time to regroom. With proper grooming equipment, such trails can be good to excellent again without additional snow.

TRACK SETTER FOR CROSS-COUNTRY SKI TRAILS

A. Purpose

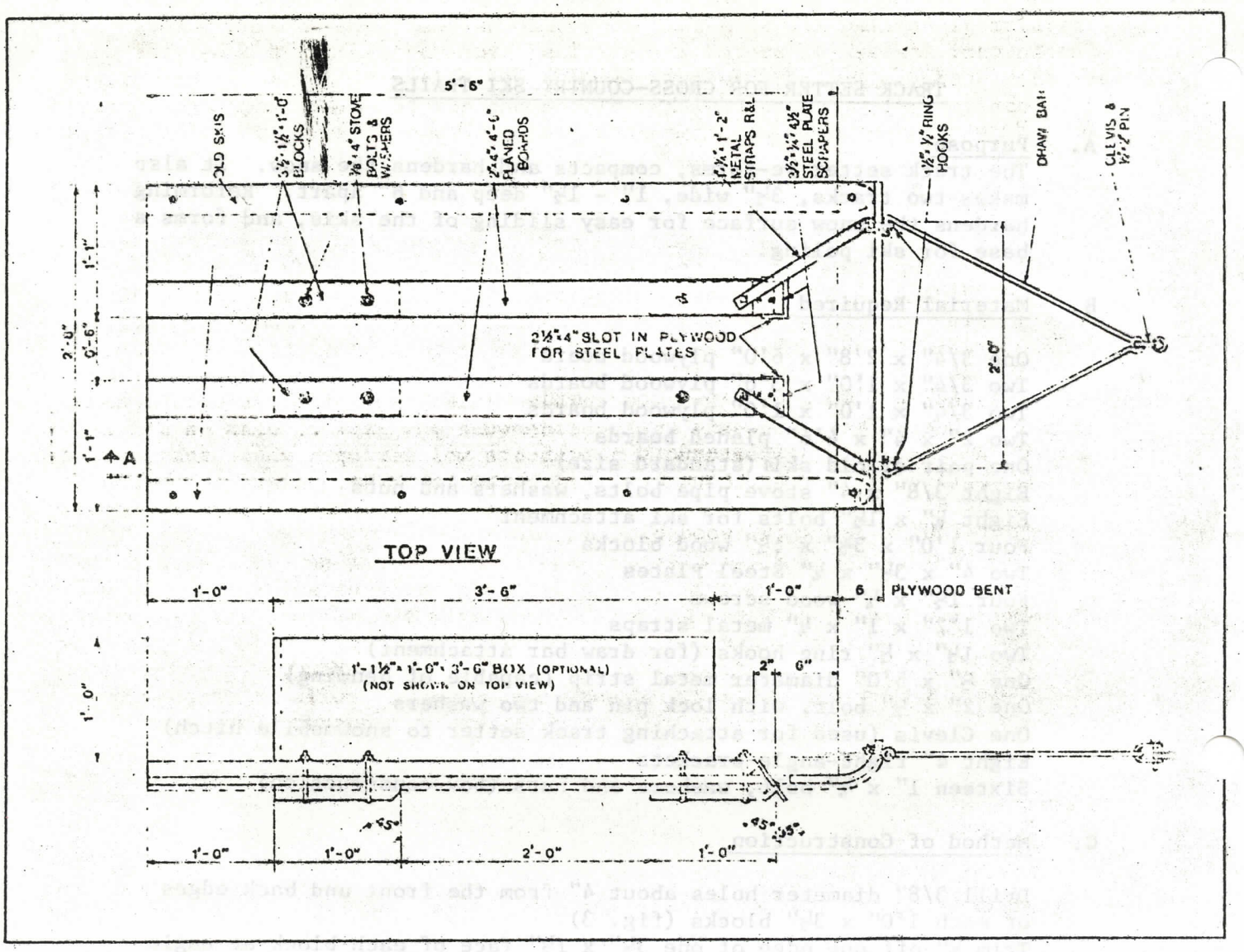
The track setter re-forms, compacts and hardens the snow. It also makes two tracks, 3½" wide, 1" - 1½" deep and 6" apart. Reforming hardens the snow surface for easy sliding of the skis, and forms a base for ski poling.

B. Material Required

One 3/4" x 2'8" x 6'0" plywood board
Two 3/4" x 1'0" x 3'6" plywood boards
Two 3/4" x 1'0" x 1'0" plywood boards
Two 2" x 4" x 4'6" planed boards
One pair of old skis (standard size)
Eight 3/8" x 4" stove pipe bolts, washers and nuts
Eight ¼" x 1½" bolts for ski attachment
Four 1'0" x 3½" x ;¼" wood blocks
Two 4" x 3½" x ¼" Steel Plates
Four 1½" x ¼" wood screws
Two 1'2" x 1" x ¼" metal straps
Two 1½" x ½" ring hooks (for draw bar attachment)
One ½" x 5'0" diameter metal strip (capable of bending)
One 2" x ½" bolt, with lock pin and two washers
One Clevis (used for attaching track setter to snowmobile hitch)
Eight 4" right-angle brackets
Sixteen 1" x ¼" bolt, washers and nuts (box construction)

C. Method of Construction

Drill 3/8" diameter holes about 4" from the front and back edges of each 1'0" x 3½" blocks (fig. 3)
Trim ½" off one edge of one 3½" x 1½" face of each block at angle of 45 (fig. 1)
Trim the opposite edges of the same 3½" x 1½" faces of one pair of blocks at an angle of 35 (fig. 1.). This pair of blocks is used at the front of the track setter. The plates are screwed with 1½" x ¼" wood screws to the 35 angled face of the blocks, and later to the 2" x 4" x 4'6" planed boards which are also trimmed at an angle of 35 . (Note: The plates pass through slots chiselled out of the plywood).
The plywood board will have to be bent in front to act as a toboggan. (To bend, soak plywood in hot water 3-4 hours, then apply about 200 lbs. pressure on edge for 2-5 days). Attach one ski on each side of the plywood with 1½" x ¼" bolts. (fig. 1) For construction of the draw bar see Appendix II.
Attach one end of each 1½" x 1" x ¼" metal strap to the planed boards, plywood and wood blocks with the 4" x 3/8" stove bolts, nuts and washers. Attach the other end of each metal strap to the curved edge of the plywood with 1½" x ½" ring hook bolts and nuts. (fig.1)
The construction of the box is optional.


5'-6"
OLD SKIS
3½"x1½"x1'-0" BLOCKS
⅞"x4" STOVE BOLTS & WASHERS
2"x4"x4'-0" PLANED BOARDS
1½"x¼"x1'-2" METAL STRAPS R&L
3½"x¼"x4½" STEEL PLATE SCRAPERS
1½" ½" RING HOOKS
DRAW BAR
CLEVIS & ½"ø PIN
2½"x4" SLOT IN PLYWOOD FOR STEEL PLATES
2'-0"
2'-6"
1'-1"
1'-1"
A
TOP VIEW
1'-0"
3'-6"
1'-0"
6
PLYWOOD BENT
1'-1½"x1'-0"x3'-6" BOX (OPTIONAL)
(NOT SHOWN ON TOP VIEW)
2"
6"
1'-0"
45°
45°
1'-0"
1'-0"
2'-0"
1'-0"

D. Conclusions

The skis on the track setter serve as guide tracks for the runners to avoid zigzagging and sinking on edge of the track setter. The plywood serves two purposes: 1) to disturb the snow, and 2) to compact and re-form the snow. The box is required to weigh down the sled, especially after heavy use of a trail. The metal plates serve as cutters to remove any patches of hardened snow or ice. Construction costs for the track setter run to about $50.00 for materials, and it takes about 20 man-hours for completion. It is suggested that several clubs contribute to the construction of the track setter as it has no other use, and if properly constructed should last for a number of years.

DRAW-BAR FOR TRACK SETTER

A. Purpose

The track setter requires a solid draw-bar to prevent it from tilting or running into the snowmobile as it is towed.

B. Materials Required

One 5'0" x 1" diameter metal rod
One old pin ½" x 5".
Vice, vice grips.

C. Method of Construction

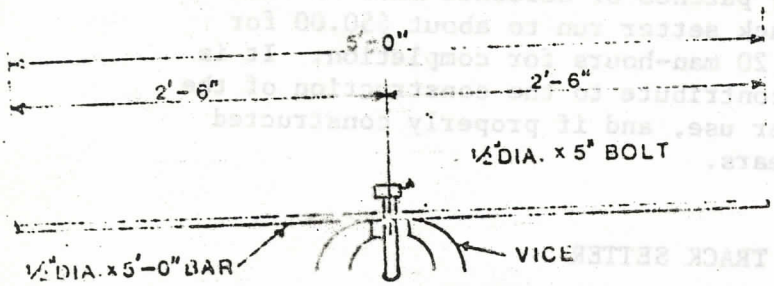
Step 1. Find the mid-point of the 5'0" rod.
Place the mid-point of the 5'0" rod behind a 5" bolt which is set in a vice.

Step 2. Pull the two ends of the rod towards you until they come in contact.
Place a vice grip on your side of the bolt on the two rods as close to the bolt as possible. Secure tightly.

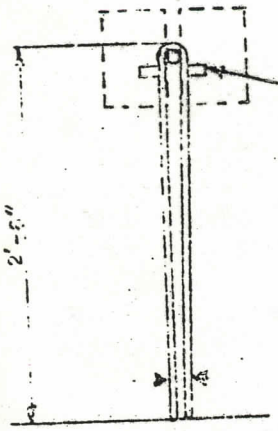
Step 3. Pull the two ends of the rod away from you until they are 2'0" apart. (See arrows Step 3.) Remove vice grip.

Step 4. Set one end of the rod in a vice and bend 1" of the rod at an angle of 90°. (Note: The draw-bar pinhole and the bend must face the same direction). Similarly bend the other side.

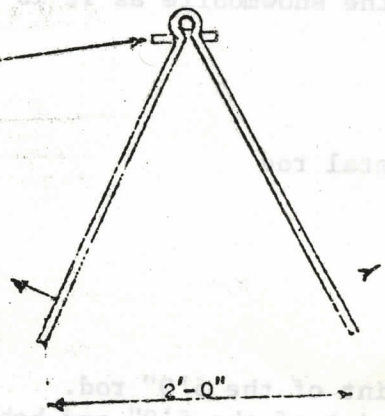
Drill 1/8" diameter holes at both ends of the rod ½" from the edge. The draw-bar is now ready for mounting on the track setter.



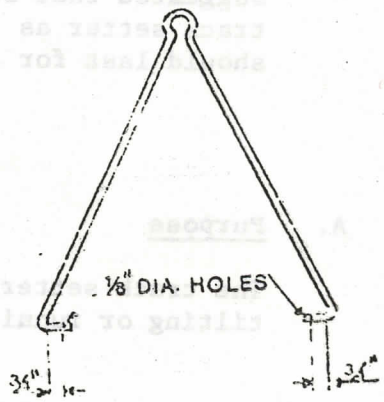
STEP 1



STEP 2



STEP 3



STEP 4

SOURCES OF GROOMING AND TRACK SETTING EQUIPMENT

Tracked Vehicles & Accessories

Alpine Distributors
P.O.Box 159, Kal Lk.Rd.,
VERNON, B.C.
Tel. 545-1314
(Bombardier Industrial Division)

Trackwield Equip. Ltd.,
6420 Beresford St.,
BURNABY, B.C.
Tel. 433-7755
(Thiokol Logan Div.)

Valley Engineering,
Gray, Maine
U.S.A. 04039
(Snowrite Products)

Compactors

Alpine Dist. or Valley Engineering

Maxey Manufacturing Co.,
P.O.Box 2001-2101 Airways Ave.,
Port Collins, Colorado
80521

"Trak-Pak",
Bullard Products,
North Hyde Park,
Vermont 05665

"Larven Grader",
Reliable Racing Supply
624 Glen St.,
Glen Falls, N.Y.
12801

Gyro Groomer

Woodcrest Corporation,
Rt. 114 North,
Bradford, New Hampshire 03221

U-Blades - Alpine Distributors or Valley Engineering

Discs - Alpine Distributors or Valley Engineering

Rotary Hoes

"Sno-Tiller",
West Mountain Sales, Inc.,
RD. #2 Corinth Rd.,
Glen Falls, N.Y. 12801

John Deere Farm Dealers

Powder Makers - Alpine Distributors or Valley Engineering

Tracksetters

Woodcrest "Track Mould"
Woodcrest Corporation,
Rt. 114 North,
Bradford, New Hampshire
03221

Baechler "Loipenstar"
Jaeger Ski Ent. Ltd.,
1958 W. 4th Ave.,
P.O. Box 34343,
Van. B.C. V6J 1M5

"Ski Track II",
Ski Traks,
R.R. #1,
Alliston, Ontario
L0M 1A0

"Trak-Pak Trak Setter"
Bullard Products, Inc.,
North Hyde Park,
Vermont 05665

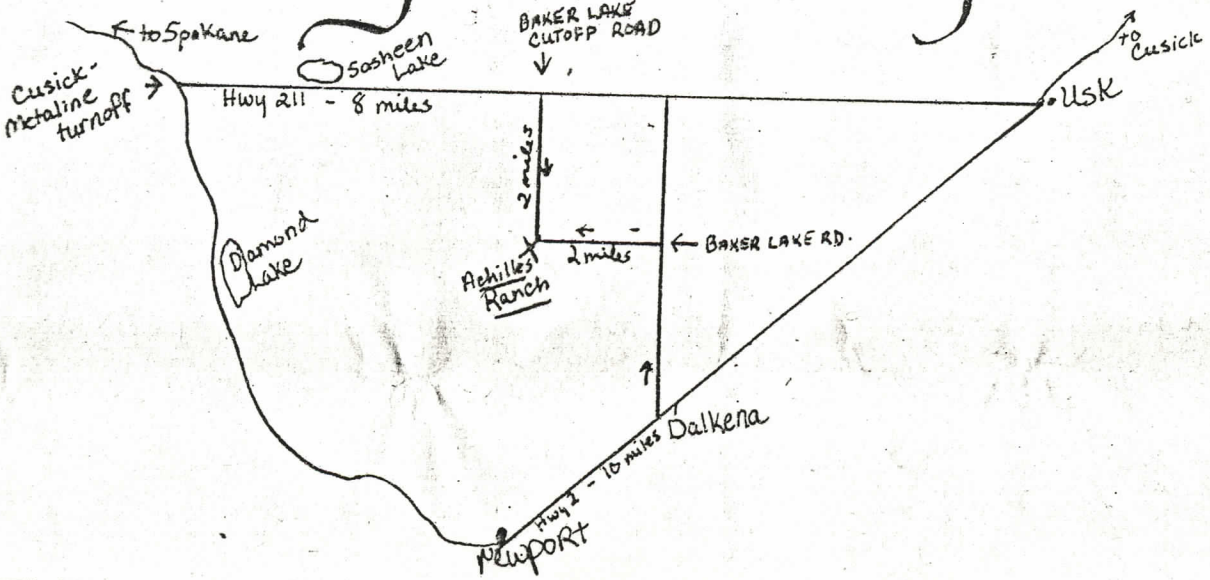
"Larven Track Setter"
Reliable Racing Supply,
624 Glen St.,
Glen Falls, N.Y. 12801

APPENDIX "K"

DISCLAIMER ON A CROSS-COUNTRY SKI TRAIL BROCHURE

Achilles Touring

15 km. Groomed Track
Beautiful Rolling Terrain
Warming and Waxing Room
$2.00 Trail Fee
Only 38 miles to Spokane



I hereby release Achilles and any of its agents or employees of any liability to my property or person while skiing or occupying the premises.

Signed: _____

APPENDIX "L"

CANADIAN ASSOCIATION OF NORDIC SKI INSTRUCTOR BROCHURE

Level IV

— To be successful the candidate must pass the Skiing Exam, the two Teaching Exams and the Seminar presentation.
— Level IV candidates that fail the Skiing Exam only may be re-examined at another Level IV Course for a fee of $15.00. Candidates must submit their Master Sheet to the Chief Examiner in order to quality for re-examination.
— Recall for Level IV Instructors is every three years.

RECALL

Recall for Instructors is a two day event designed to refresh Level II, III and IV members every three years.
The Recall can be fulfilled by:

(1) attempting the next required Level of certification.
(2) attending a Refresher Course.
(3) attending a Briefing Course for C.A.N.S.I. Course Instructors andExaminers.

Recall for C.AN.S.I. Course Instructors and/or Examiners is designed to refresh Course Instructors and Examiners every two years.
The Recall is fulfilled by attending another Briefing Course for C.A.N.S.I. Course Instructors and Examiners.

REFRESHER COURSE

Refresher Course Prerequisites

The Instructor must be a Level II, III or IV C.A.N.S.I. member in good standing. (C.A.N.S.I. Course Instructors and Examiners refer to Briefing Course).

Refresher Course Format

Refresher Courses are held over a minimum of two consecutive days.
Refresher Courses are National responsibility. Regions hosting a Refresher Course must have applied to the National Technical Committee.
The Course content will include updating skiing and teaching skills plus an evening Seminar.

Refresher Courses

— All Refresher Courses must be run by a Level IV Examiner.
— Every Instructor that participates in a Refresher Course fulfills the recall requirements for the next three years.

BRIEFING COURSE FOR C.A.N.S.I. COURSE INSTRUCTORS AND EXAMINERS

Briefing Course Prerequisites

The candidate must be a C.A.N.S.I. Level II, III or IV member in good standing.

Briefing Course Format

Briefing Courses are held over a minimum of two consecutive days.
Briefing Courses are National responsibility and Regions hosting a Briefing Course must have applied to the National Technical Committee.
The Course content will include skiing, teaching and examining skills plus an evening Seminar on C.A.N.S.I. Administration Procedures, Seminar Techniques, etc.

Briefing Course

— A Level IV Examiner will decide which candidates are successful.
— A successful Level II candidate will become an Instructor for Level I Courses.
— A successful Level III candidate will become an Instructor for Level I and II Courses and an Examiner for Level I Courses.
— A successful level IV candidate will become an Instructor for Levels I, II and III and an Examiner for Levels I and II.
— Instructors for Level IV Courses and Examiners for Level III and IV will be appointed by the National Technical Committee from Level IV Instructors.
— The National Technical Committee may limit or invalidate C.A.N.S.I. Course Instructor and/or Examiner status at any time.
— Candidates that wish to upgrade their Course Instructor and/or Examiner Status must attend a full Briefing Course again.
— Recalls for Course Instructors and/or Examiners is every two years.
— Every Instructor that participates in a Briefing Course fulfills Instructor recall requirements for the next three years.

PRE-COURSE

Participants must be a minimum of sixteen years of age.
Pre-Courses are organized and run at a Regional Level.
Pre-Course format will be similar to the Level I Course without formal evaluation.
Pre-Courses are designed to improve the ability of anyone wishing to attempt C.A.N.S.I. Instructor certification.

CLINIC

Participants must be a minimum of sixteen years of age.
Clinics are organized and run at a Regional Level.
Clinics are one day on snow with an evening seminar.
Clinic content will include information on equipment, waxing, clothing, winter safety, technique, etc. Clinics will be useful for anyone interested in improving their knowledge and enjoyment of cross country skiing.

For additional information please contact C.A.N.S.I. British Columbia or the C.A.N.S.I. Head Office.

C.A.N.S.I. British Columbia
#208 1331 Marine Drive
West Vancouver V7T 1B6
Tel: (604) 926-7471

C.A.N.S.I. Head Office
3300 Cavendish Blvd., Rm. 645
Montreal, Quebec H4B 2M8
Tel: (514) 489-0576

CANADIAN ASSOCIATION OF NORDIC SKI INSTRUCTORS

ASSOCIATION CANADIENNE DES MONITEURS DE SKI NORDIQUE
CANADIAN ASSOCIATION OF NORDIC SKI INSTRUCTORS

INFORMATION AND STANDARDS FOR C.A.N.S.I. COURSES

The Canadian Association of Nordic Ski Instructors was formed from the Canadian Ski Association, Canadian Ski Instructors Alliance and Ski Quebec. Since its creation in 1976 C.A.N.S.I. has gained an enviable reputation both nationally and internationally for having developed an organized and progressive program for cross country ski instruction.

C.A.N.S.I. runs four levels of Instructor Courses to certify Nordic Ski Instructors: Refresher Courses to update C.A.N.S.I. Instructors, Briefing Courses to become C.A.N.S.I. Course Instructors and/or Examiners, Pre Courses to prepare for Instructor Courses and Clinics to promote cross-country skiing.

LEVEL I

Level I Prerequisites

Minimum of sixteen years of age and able to perform the following manoeuvers: Diagonal Stride, Diagonal Stride Uphill, Double Poling, One Step Double Poling, Straight Running, Step Turn While Running, Snowplow, Snowplow Turns, Traverse, Sidestep, Herringbone, Star Turn, Kick Turn.

Level I Skiing Exam will consist of:

- Diagonal Stride
- One Step Double Poling
- Snowplow Turns

Level I Teaching Exam will consist of one of the following:

- Diagonal Stride Without Poles
- Diagonal Stride With Poles
- Double Poling
- One Step Double Poling
- Diagonal Stride Uphill
- Step Turn While Running
- Snowplow
- Snowplow Turns

Level I Course Format

Level I Courses are held over a minimum of two consecutive days.
Level I Courses are organized and run at a Regional level. Candidates normally register by mail, receive a receipt for registration and a Course Itinerary along with details regarding location, lodging, meals, etc.
The Level I Course Content will include all the manoeuvers and teaching requirements previously set out plus an evening seminar including information on: Winter Safety, Equipment, Waxing, Conditioning, Structure and Objectives of C.A.N.S.I., etc.

Level I

— To be successful the candidates must pass all three SKI OFF Manoeuvers and must also pass the Teaching Exam.
— Level I Candidates that fail must attend a full Level I Course again.
— There is no recall for Level I Instructors.

SAMPLE LEVEL I ITINERARY

Day 1

8:00 Completion of registration (manuals, etc.), explanation of itinerary, question period, waxing, etc.
9:00 On snow warm up and informal feedback given to candidates stressing which manoeuvers need to be strengthened. If video is available candidates will be briefly videoed practicing their SKI OFF manoeuvers and this will be viewed during the evening session.
9:30 Instructors model C.A.N.S.I. Progression in accordance with the manual.
12:00 Lunch.
1:00 Practice Teaching and brief review the principles of teaching and what the Examiners will be looking for. The Course Instructors and Examiners will give constructive feedback to all candidates regarding their Practice Teaching.
4:00 Break.
7:30 Evening Session (two hours) will include information on Winter Safety, Equipment, Waxing, Conditioning, Structure and Objectives of C.A.N.S.I., etc.

Day 2

9:00 General review and Practice teaching. In some instances the Teaching Exam may begin during this time period.
11:00 Teaching Exam. In some instances the Skiing Exam may begin during this time period.
12:00 Lunch.
1:00 Skiing Exam.
3:30 Completion of Marking Sheets.
4:00 Awards presented to successful candidates. Copies of marking sheets and constructive feedback will be given to every candidate.

LEVEL II

Level II Prerequisites

The candidates must be a C.A.N.S.I. member in good standing. Ten months must have elapsed since passing a Level I Course. In addition to the Level I maneouvers the candidate must be able to perform the following manoeuvers: Three Step Diagonal Stride, Changeovers, Skate Turn, Highland Low Tuck Position, Glide Christie, Diagonal Traverse with Kick Turn, Diagonal Sidestep with Traverse Turn.

Level II Skiing Exam will consist of:

- Diagonal Stride on the Flat and Uphill
- One Step Double Poling
- Skate Turn
- Glide Christie

Level II Teaching Exam will consist of two of the following:

- Diagonal Stride with Poles
- Double Poling
- One Step Double Poling
- Three Step Diagonal Stride
- Changeovers
- Skate Turn
- Glide Christie
- Diagonal Stride Uphill
- Diagonal Traverse with Kick Turn
- Step Turn While Running
- Braking Snowplow
- Snowplow Turns

Level II Course Format

Level II Courses require a minimum of 45 hours and may be held over five consecutive days or two consecutive weekends commencing Friday at noon.
Level II Course Content will include the manoeuvers and teaching requirements previously set out plus evening seminars including information on: Structure and Objectives of C.A.N.S.I., Winter Safety, Equipment, Waxing, Biomechanics, Conditioning, etc.

Level II

— The Skiing Exam will be on appropriate terrain with candidates performing most of the Exam while skiing on a loop.
— To be successful the candidate must pass all four SKI OFF Manoeuvers and must also have a combined mark of more than 50% from the Teaching Exams.
— Level II Candidates who fail the Skiing Exam only may be re-examined on their skiing for a fee of $15.00 at another Level II Course no later than one ski season following the failed Skiing Exam. Candidates must submit their Master Sheet to the Chief Examiner in order to qualify for re-examination.
— Recall for Level II Instructors is every three years.

LEVEL III

Level III Prerequisites

The candidate must be a C.A.N.S.I. member in good standing. Ten months must have elapsed since passing a Level II Course. The candidate must be able to perform every manoeuver in the Manual.

Level III Skiing Exam will consist of:

- Diagonal Stride on the Flat
- Diagonal Stride Uphill
- Three Step Diagonal
- Changeovers
- Elementary Christie

Level III Teaching Exam will consist of two of the following:

- Diagonal Stride
- Double Poling
- One Step Double Poling
- Three Step Diagonal Stride
- Changeovers
- Skate Turn
- Four Step Diagonal Stride
- Diagonal Stride Uphill
- Step Turn While Running
- Braking Snowplow
- Snowplow Turns
- Glide Christie
- Elementary Christie
- Telemark Turn

Level III Course Format

Level III Courses require a minimum of 45 hours and may be held over five consecutive days or two consecutive weekends commencing Friday at noon.
Level III is National responsibility and Regions hosting a Level III course must have applied tothe National Technical Committee.
Level III Course content will include the manoeuvers and teaching requirements previously set out. The evening Seminars are the same as Level II with a Seminar on C.A.N.S.I. Administration and Exercise Physiology. Each candidate must participate in a Seminar and will receive constructive feedback on their presentation.

Level III

— The Skiing Exam will be on appropriate terrain with candidates performing most of the Exam while skiing on a loop for a minimum of thirty minutes.
— To be successful the candidate must pass all five SKI OFF Manoeuvers and must also pass the two Teaching Exams.
— Level III candidates that fail the Skiing Exam only may be re-examined on their skiing for a fee of $15.00 at another Level III Course no later than one ski season following the failed Skiing Exam. Candidates must submit their Master Sheet to the Chief Examiner in order to qualify for re-examination.
— Recall for Level III Instructors is every three years.

LEVEL IV

Level IV Prerequisites

The candidate must be a C.A.N.S.I. member in good standing. Ten months must have elapsed since passing a Level III Course. The candidate must have attended a "BRIEFING COURSE FOR C.A.N.S.I. COURSE INSTRUCTORS AND EXAMINERS" and must submit a resume of their Instructor and/or Examiner experience to the National Technical Committee. The Candidate must be able to perform and teach every manoeuver in the Manual.

Level IV Skiing Exam will consist of:

Terrain Skiing using appropriate manoeuvers.

Level IV Teaching Exam will consist of:

Any two manoeuvers in the Manual and one Seminar presentation.

Level IV Course Format

Level IV Courses are held over a minimum of seven consecutive days.
Level IV is National responsibility and will be organized by the National Technical Committee.
Level IV Course Content will include everything in the Manual and each candidate must give an in depth Seminar presentation.