MOUNT BACHELOR'S PINE MARTEN SNOWFENCE

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Opening the Pine Marten lift at Mt. Bachelor, Oregon, in 1986 presented new opportunities for skiers (Figure 1). But problems with wind erosion at the lift's upper landing also presented new challenges for slope grooming. A large wind-swept area around the upper terminal prevented skier access to good skiing on lower slopes. Groomers relocated snow from a natural accumulation below the landing, but the long, uphill push and the extensive area needing snow made this an expensive solution. A vertical-slat snow fence 1.2 m (4 ft) tall, build near the landing (Figure 2), did not capture sufficient snow, but it did indicate that a taller snowfence might help. This paper describes construction and results of a tall snowfence that solved the problem.

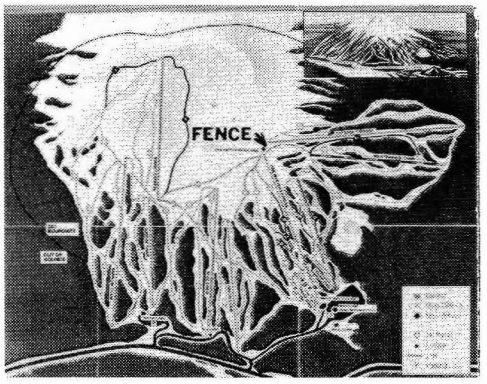

Figure 1 A trail map of Mt. Bachelor and a photograph of the Pine Marten lift show the location of the problem area near the lift's top terminal.

Mt. Bachelor is 35 km (22 mi) west of Bend, Oregon, in the Deschutes National Forest, between 1800 and 2700 m elevation (6000 to 9000 ft). Snow accumulation typically begins in October and the ski season runs from mid-November, often into July. An average snowfall of 1270 cm (500 in), yields a base of 380-500 cm (150-200 in), and snowpack reaches a peak near the first of April. The upper terminal of the Pine Marten lift (Figure 2) is on a ridge exposed to strong southwest winds. Persistent snowcover in this unforested area is confined to topographic depressions and the lees of scattered trees and rocks.

SNOWFENCE DESIGN

Research has demonstrated that a single tall snowfence costs less per unit volume of snow stored than several rows of shorter fence that accumulate an equal volume (Tabler, 1986). The same work shows that even small gaps in

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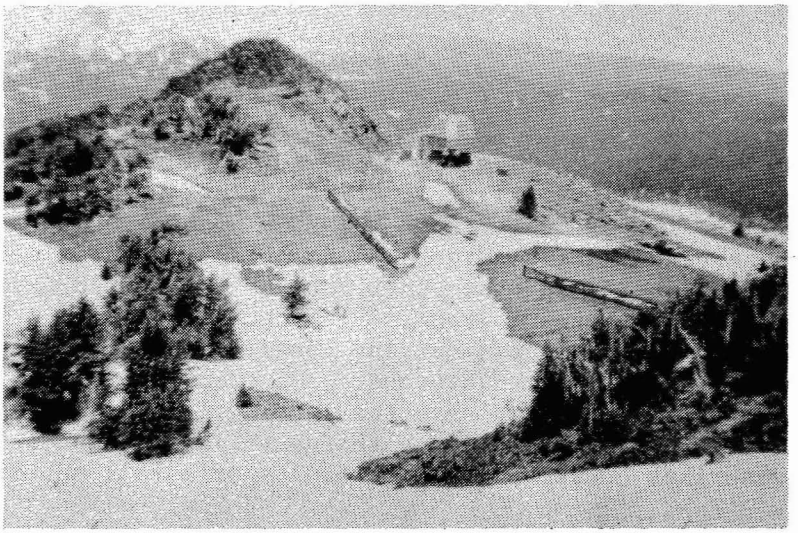

Figure 2 A 1.2-m snowfence near the top terminal of Pine Marten lift did not accumulate enough snow to cover the wind-swept area during the 1986-87 season.

a snowfence greatly reduce the volume of snow stored. Using this information, a 3.7 m (12-ft) snowfence 118 m (387 ft) long was designed to replace the 1.2 m fence. Built in the fall 1987, the new fence uses plastic fabric (TENSAR*) supported on 28 poles of thick-walled steel pipe. The poles are 10-cm (4-in) outside diameter and 5.2 m (17 ft) long, spaced 13 feet apart. Each pole is embedded to a depth 1.2 m (4 ft) below the ground surface, with the bottom of the pole set in concrete (Figure 3). Plastic buckets (5 gal) with the bottoms removed provided forms. To increase pole stability, wooden cribbing boxes 0.6 m (2 ft) in diameter and 0.3 m (1 ft) deep were centered around the pole, wired in place close to the surface, and filled with rock.

The 1.2-m wide fencing fabric was attached to a support pole at one end then unrolled on the upwind side of the poles. The material was spliced by overlapping and weaving in a wood lath. The fence was designed so height could be increased as snow accumulated, by adding tiers of fabric. At the start of the 1987-88 snow accumulation season, the effective fence height was 2.7 m (9 ft), with the exception of two 1.2-m high gates near the center of the fence. This starting height (2 tiers of fabric plus a bottom gap) was chosen to maximize fence height and still keep wind loads low enough that the fence would stand without guy wires, which would present a hazard to skiers as well as limit grooming activity around the fence.

Three 8-m (26-ft) openings allowed skiers and equipment through the fence. Removable gate panels were put in place before each storm to increase fence storage capacity by eliminating gaps. These panels consisted of fabric fencing, posts, lath, karabiners and rope (Figure 4). Each end of the gate

*The use of trade and company names is for the benefit of the reader; such use does not constitute an official endorsement or approval of any service or product by the U.S. Department of Agriculture to the exclusion of others that may be suitable.

fencing was wrapped around a 10-cm (4-in) diameter wood post, and held in place by weaving wood lath through the fence fabric. Karabiners were attached to the support poles and wood gate posts with 1-cm nylon rope. The panels are held in place and tensioned with additional rope.

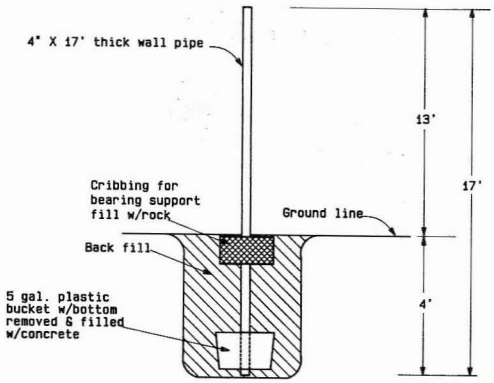

Figure 3 Detail of pole embedment (dimensions in feet).

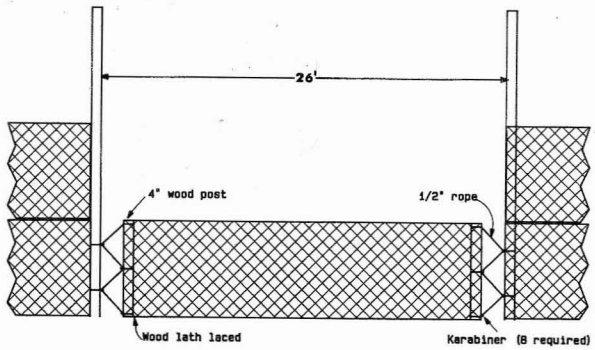

Figure 4 Detail of removable gate panels.

CONSTRUCTION COSTS

Labor, material, and their approximate 1987 costs are listed in Table 1. Average cost per unit of fence length was $27.42 per meter ($8.36/ft).

Table 1. Pine Marten Snowfence Construction Costs ($U.S.)

Backhoe (8 hr)	$200	
Crane or hoist (16 hr)	400	
Pole installation (16 hr)	112	
Installing fence fabric (24 hr)	168	
Gate fabrication (8 hr)	56	
Labor costs		$936
28 poles (17 ft steel pipe)	$1000	
366 m (1200 ft) fencing (1.2 m wide)	1200	
Cement and miscellaneous hardware	100	
Materials costs		$2300
TOTAL COST		$3236

FENCE PERFORMANCE

Snow accumulated by the fence was relocated by groomers to cover the Pine Marten landing and travel routes to the Outback lift landing (established in 1987). Snow storage was sufficient to open up additional terrain to skiing, by covering rocks and bare ground (Figure 5). The partial removal of drifted snow after each storm renewed fence storage capacity. As much fence as possible was exposed after each drifting event. When snow in the fence area became so compacted groomers could not expose sufficient fencing, the final 1.2-m (4-ft) tier was put in place. The fence withstood heavy rime build-up and burial with minimal damage.

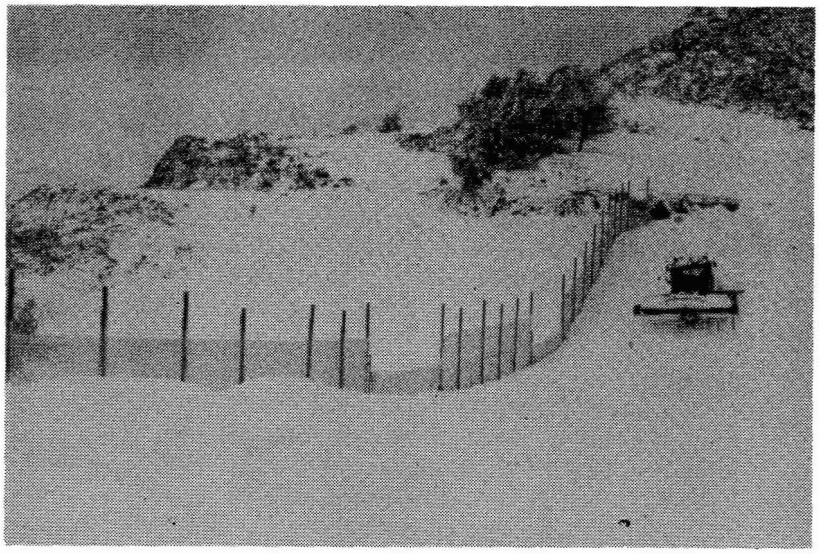

Figure 5 Groomers relocated snow trapped by the fence to cover the Pine Marten lift landing and establish snow routes to other trails.

Grooming snow from this snowfence installation allowed the Pine Marten lift to be opened two to three weeks earlier than would have been possible without the fence. When snow depth at the base elevation was only one third the peak depth of the previous year, groomers already had used snow from around the snowfence to provide better coverage around the Pine Marten landing than was possible at peak accumulation the season before (Figure 6).

Figure 6 The snowfence provided a source of snow much nearer the problem area, allowing the lift to be used 2-3 weeks earlier and greatly improving snowcover around the landing throughout the 1987-88 winter.

REFERENCE

Tabler, Ronald D., 1986, Snowfence Handbook, Release 1.1, R. D. Tabler and Associates, Box 576, Laramie, Wyoming, 82070.

CARDA,and the avalanche rescue dog.

by: Willi Schneider,Chairman,Programs-Development.

CARDA,is a volunteer non profit charitable organization.Our goals are to train and maintain a network of highly efficient avalanche search and rescue teams across Canada.We are committed to saving the avalanche victim.

The aim is to train dogs and handlers so that they are prepared to save human lives.Every failure which is the result of lack of capability will end in an intolerable situation.It should be differentiated between sport and professionalism.Avalanche rescue shools are not sportlike undertaking but rather a professional training geared to achieve winter rescue in alpine terrain.

Man and dog through their action at a rescue mission must radiate competence and success.In this manner all participants will be steered in a positive manner until the operation is finished.The aim is to save human lives in an avalanche.The training of the dogs takes place during technical courses.As only a limited time span is available it is necessary that the handler - to - be is familiarized only with the data concerning avalanche dog training.In summer as well as winter,the handler has to train the dog at his location to the standard of recognized methods.Only in this way can he achieve success in having a reliable dog.

As well as a dog,the handler must be trained in all phases of avalanche rescue. It is imperative that the dog and master form a team in order to be sucessful in search and rescue.Intelligence and nose have to be combined.

Anyone who operates in isolation will not be able to succeed.

The dog handler is not only a dog handler but is also to be considered an alpine dog handler.This means that the avalanche rescue dog handler must be considered a knowledgeable and capable of carrying out alpine tasks.Not only the dog,but also the dog handler must train as a mountaineer all year around.

Basic training for the uninitiated dog is to learn to search for human beings under a snow cover.The progression deals with the advancement and complexity searching on an avalanche,burial depth,large areas to be searched,dirty avalanches,adverse weather conditions,ect.

To establish and maintain high standards of competence for both dogs and handler engaged in avalanche search and rescue,CARDA established a 3 stage training and certification program:AvD 1/AvD 2/AvD 3.

AvD 1: The dog must be able to positively indicate the burial location of a person covered by 80 cm. of snow.This must be done within a search area of about 40x60 mtrs.on an artificial or natural avalanche deposit.

- must pass the CARDA obedience test.

The handler:

- must be able to handle intermediate ski terrain safely(with touring equipment.)
- must be in a condition to be able to climb intermediate alpine terrain in winter conditions.
- must be knowledgeable in lifesaving First Aid techniques(basic first aid)
- must be able to lead the dog efficiently.
- must be able to employ the dog properly even during wind or adverse conditions.
- must be able to read the signals of his dog.

AvD 2: The dog must be able to locate quickly two(2) living persons buried at a depth of up to 1.5 mtrs.This must be accomplished either on a natural or artificial avalanche deposit of a size of about 60x80 mtrs.

- must show endurance when searching during extremely cold weather and strong winds.
- must not retrieve articles from the avalanche site.

The handler:

- in addition to those requirements listed above,he must be able to make proper evaluation of a simple accident situation.
- efficient application of the dog even when strong distracting conditions exist or even if the team is tired.
-being able to lead the dog through coarse and fine probe manoeuvers.
- being able to resuscitate a victim either by mouth-to-mouth or bag method (advanced First Aid) Industrial First Aid Ticket"A"or"B"or:C".
- must be familiar in navigation,to read maps,work with compass and altimeter.

AvD 3: The dog,in addition to the above must,quick locate a number of persons and articles(backpack,clothing,etc,)in an area of about 80x150 mtrs.,burial depth for persons should be up to 2 mtrs, and for articles 80 cm.

- intensive search procedure even under difficult conditions such as large blocks,impurities in the snow etc.
- show endurance.

The dog is not a miracle weapon when looking at search and rescue requirements;however it is an additional method if properly employed,properly kept and trained.The dog is able to locate persons and equipment in an extremely short span of time.The result is that he reduces the normally required search period and saves manpower.As with humans,search dogs have limitations.Capabilities however can be broadened by training but may be reduced when nature presents adverse conditions.Generally speaking,no technical device can be an equivalent to the highly sensitive nose of the search and rescue dog.The search speed of the dog is also a factor.The search and rescue dog is not simply an animal;he is special,the best friend of the master and in general terms,the friend of all persons.Therefore he must be treated as such;must be cared for and trained.From youth on,the search and rescue dog must be treated and trained in such a way that he adapts to the difficult task of search and rescue.That means that he must become tough in order to withstand adverse weather conditions and have the required endurance.
The avalanche search and rescue dog is still the most effective tool in finding avalanche victims.
According to "IKAR" the avalanche search and rescue dog will find:
-all buried victims still alive or those who died shortly before the operation,normally regardless of burial depth and nature of the avalanche snow.
-dead victims in porous or lumpy avalanche snow up to a depth of about 2 mtrs.
-dead victims in compact avalanche snow up to a depth of about 1 mtr.
-living and dead victims in very dirty catastrophic avalanches.
The search speed of a dog compared to a saerch of 20 probers:
To search an area of 1 ha,=10.000 sq.mtrs.:
The dog needs about 30 min. for a coarse search-The team of 20probers,about 4 hrs.
fine search:the dog about 1 to 2 hrs,the probe team,about 20 hrs
The aim for all this training for man and dog means that they are ready and prepared to save human lives.The avalanche search and rescue training is done during trade courses.As well as the dog,the handler must also be trained in avalanche and operational subjects.Avalanche search and rescue operations require that a team is established between dog and handler.(nose and intelligence)The master not only has to be a dog handler,he must also be an alpine dog handler.This means that the avalanche search and rescue dog

handler must possess capabilities and knowledge in handling and travelling in alpine terrain. This knowledge will prepare him and his dog to handle rescue missions during daylight and night hours. Success is achieved when dog and handler work in union. The knowledge the dog handler has,and the trained nose of the dog play an important role in the success of a rescue mission.

In Europe,over 1,000 avalanche search and rescue dog - handler teams are in existence at the present,and is considered the most effectve method of saving the avalanche victim. The success rate is very high in comparison to probe rescue teams or electronic locators.

In Canada however,there has not yet been a successful rescue of an avalanche victim using an trained avalanche search and rescue dog - handler team, through no fault of the existing search and rescue teams special trained for avalanche rescue.

Avalanche accidents grow alarmingly from year to year in our country.

Can we afford to fall behind in employing the high standard of rescue service needed and available today,to save the victims of avalanches from death ?.

We can and should not.