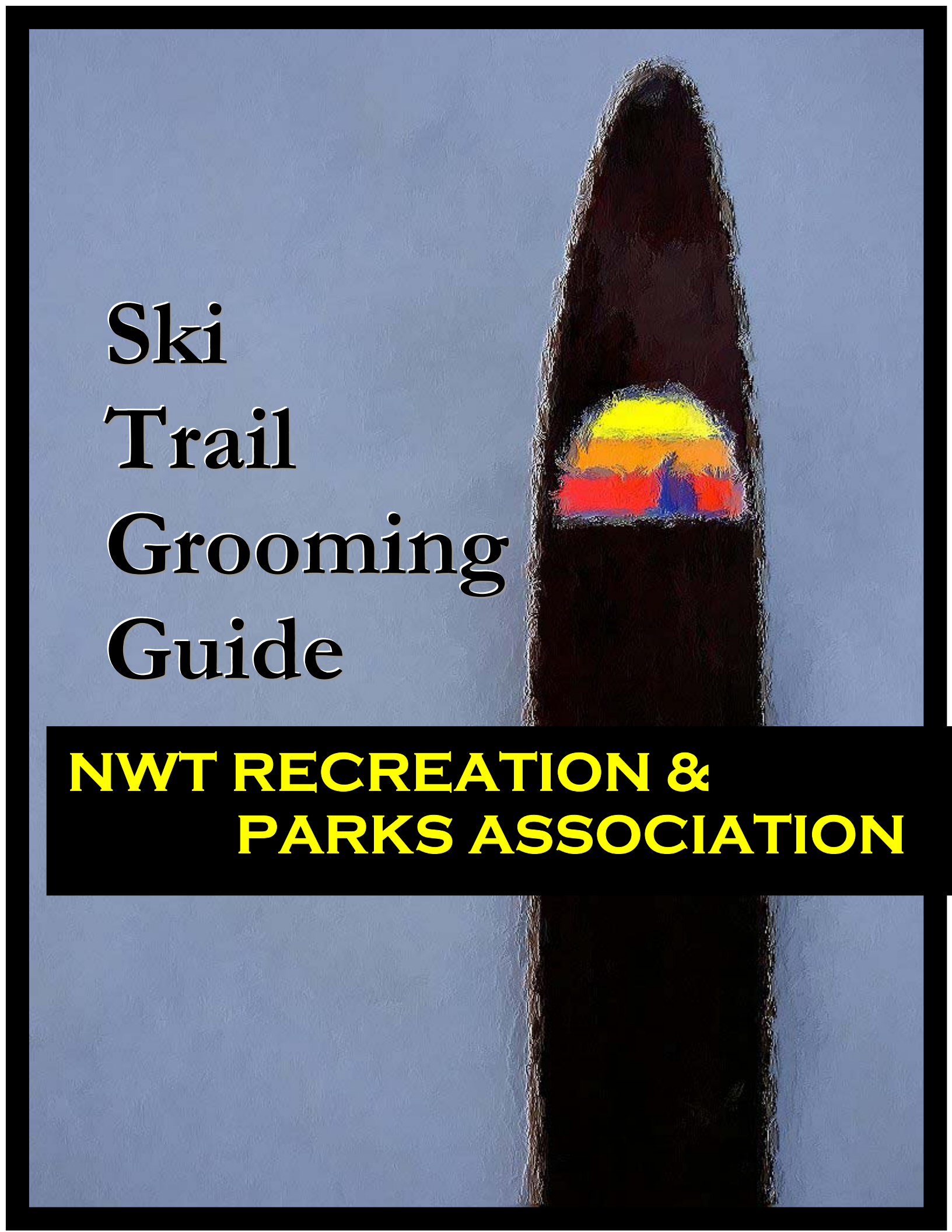

Ski
Trail
Grooming
Guide
NWT RECREATION &
PARKS ASSOCIATION

introduction

NWT communties are connected by countless numbers of trails, though few of them are dedicated ski trails. With a little work, some equipment and know-how, ski doo trails, walking trails, cutlines, riverbeds, fields and lakes can be turned into quality ski trails. And it's well worth the effort. Groomed and tracked ski trails are easier to ski on, easier to learn on, better to race on and a whole lot faster than bush trails. Groomed trails turn skiing into skiing!

CCC/Morten Byskov

The two main ski techniques: classic skiers use set tracks and narrower trails, while skate skiers require flat, wide lanes to ski on. In the NWT, classic skiing is more common and best suited to the cold temperatures of northern winters. (Photos courtesy Cross Country Canada)

There are two main cross-country ski techniques for which trails can be groomed. Skate skiing -as its name suggests- looks a lot like skating and requires a wide, flat and smooth track, or lane. Classic skiing can be described as a gliding walk or run. Parallel tracks are set into the snow for classic skiing. In both cases, grooming simply means working and re-working snow to provide consistent conditions for skiers. It can be relatively simple or very complex depending on conditions, the desired end product and the time and equipment available. The whole grooming program can be broken down into several basic processes:

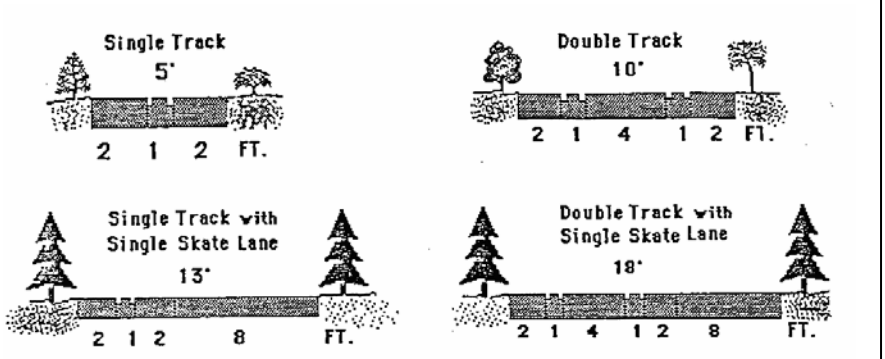
- pre-season preparation,
- packing,
- levelling, and
- track-setting (for classic skiing).

A polite reminder in Nahanni Butte to respect the effort that goes into ski trail grooming.

Within each section of this guide, you'll find descriptions of these basic processes: the methods, the tools and some tips for each grooming procedure. This isn't a recipe book, though, nor is it comprehensive. Ski trail grooming is part science, part art, part magic and a whole lot of experience. The more practice you get, the better you will understand how to groom in your neck of the woods. You'll also probably encounter some unexpected challenges. Hopefully, the Frequently Asked Questions (FAQ's) at the end of this guide will prove helpful. If not, trail groomers are usually a helpful bunch. If you don't know any ski trail groomers in your region, call the NWTRPA Trails Coordinator for a list of possible contacts.

Happy trails!

1 Pre-Season Preparation



Ideal trail widths for classic and skating trails: skiers need room beside the trail to plant their poles, let other pass and fall, from time to time.

The Process-

Making good ski trails starts even before the snow begins to fly. Giving some thought to trail lay-out will benefit your grooming and skiing experiences. Pick or cut trails with a variety of terrain and with corners that are long and wide enough to accommodate grooming equipment and skiers. Also, a set of trails with short, connecting loops will give you lots of options for beginners and experts alike. One thoughtless snowmobile can ruin a well-set ski trail, so you should also plan to place barriers or signs at trail access points that announce that your ski trail is intended for skiers.

Fallen trees, rocks, stumps, willows and overhanging branches all conspire to make your winter trail rough and hard to travel. Assembling a crew of workers in the fall is the best way to brush the trail, clear deadfall and obstructions from the trail surface. The smoother the trail, the less snow you will need to cover up debris with your 'pre-base'. The 'pre-base' is created by packing the first snowfall into a hard, icy sheet that gives your trails a firm support and prevents the ground from warming the snow during the winter. (see Section 2- Packing) How much brushing you will do depends on what sort of skiing you want on your trail. A narrow, snowmobile trail can easily be converted into a single-track ski trail. Skate skiing and double-tracks require more room and so will need more brushing.

The Tools - Besides volunteers' arms, legs and backs, essential trail prep. tools include: chainsaws, brushcutters, axes, rakes (to gather all those pesky clippings) shovels and picks. Preseason preparation can also involve snow- and ice-sculpting, in which case skidoos, toboggans, shovels, snowscoops, chisel and needlebar may prove useful.

Technique & Tips- Trails can often be 'engineered' with snow to fill persistent dips and holes or to make sloping trails level. In the accompanying picture, members of the Hay River Ski Club move and shape snow to prevent the trail -and skiers- from sliding off course. Mounds of 'harvested' snow will be flattened, converting a side-slope into a level surface for packing, levelling, tracksetting and skiing. This sort of engineering is temporary and will need to be done at the start of every ski season.

NWT RECREATION & PARKS ASSOCIATION

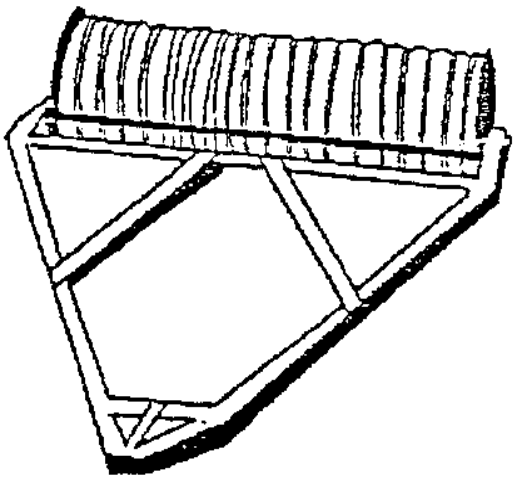
2 Packing

The Process – Removing the air from fallen snow –the goal of packing – allows snow crystals to bond tightly to one another, creating a dense and supportive trail base. Packing also smoothes the trail, filling dips in the ground. Normally, the process involves dragging packing implements behind a snowmachine. Early in the season, however, low amounts of snow often require packing only with a snowmachine; multiple passes will create a consistently dense base that will be wide-enough to accommodate ski tracks, and, eventually, bigger, more efficient packing implements. In Yellowknife and the South Slave, ski trail packing usually begins as soon as there is enough snow for snowmobiles, usually in early- to mid-November. It may be earlier in more northerly regions.

Ideally, you should pack your trails with every 5-6" (12-15cm) of new snow. This won't always be possible, though. With big dumps of snow, packing implements will bog down. In these cases, trails may have to be packed with snowmobiles first and then levelled (see Section 3 – Levelling) to a smooth surface before the ridges and grooves made by snowmachines 'set-up' or harden.

The Hay River Ski Club's roller/packer: two 45 gallon drums welded together.

The Tools – Unless you own a thousand-dollar snowcat, chances are you'll need a snowmobile for your trail grooming. A grooming snowmachine should have low gearing and a long track to pull the equipment at slow speeds, about 10-20km/hour. Though they're no longer sold and parts are hard to come by, double-track Alpines are ideal and are still used by some groomers. Skandics or similar bush-machines have good power and are a popular choice. A note of caution: liquid cooled machines tend to overheat as packed trails don't throw up enough snow to cool a hard-working machine.



Another homemade roller: close the ends of a culvert and install a tow-bar.

While the snowmobile itself is an effective packer, the narrow track means that it can take a long time to pack the width of a trail. Groomers often use rollers or compaction pans/bars to pack a wide trail.

Rollers are useful in low-snow and heavy-snow conditions; because

they don't drag through the snow, they won't catch or bog down. Home-made rollers are often built from drums and culverts. Culverts will leave a bumpy track, however, that will need to be leveled before setting ski tracks. Commercial rollers are also available from the suppliers listed at the end of this guide.

In Nahanni Butte, a compaction-type pan is filled with snow and pulled behind a snowmobile to pack 5 km of double-wide classic trails.

Compaction bars and pans offer some advantages over rollers. Because they level the snow at the same time as they pack, less snowmobile passes will be required. As well, bars and pans tend to ice-up less than rollers – important in warm and wet snow. Finally, compaction equipment can be operated at somewhat higher speeds than rollers, without causing 'washboarding' on the trail. Such equipment can be purchased from grooming suppliers listed below, though improvised equipment can do the job. For both rollers and compactors, implements need to be weighted in some way to effectively pack the snow.

Technique and Tips - Anyone who's ever made a snowball knows that cold, dry snow doesn't pack all that well. If left undisturbed, though, even a cold, dry trail will sinter, or 'set-up' after a period of time. Be careful not to wait too long between packing, levelling and track setting or the surface may become too hard for tracks. Only a very heavy tracksetter (see Section 4) will set ski tracks in a densely packed and sintered trail.

At the other extreme, grooming warm snow should be avoided. Equipment is likely to bog down in heavy, wet conditions, and if cold nighttime temperatures are expected, your ski trails will end up feeling more like a rock-hard skating rink.

3 Levelling

The Process - It can't say be said enough: a ski trail needs to be both as smooth and level as possible. The smoother the surface over which your snowmobile can travel, the straighter the tracksetter will follow. A compaction drag (see above) that packs and levels at the same time may create a trail surface smooth enough for track-setting and skiing. If not, bumps, dips, drifts and clumps of snow will need to be levelled. Levellers work like graders: scraping snow off high spots and depositing it in low spots.

K'atl'odeeche First Nation ski trails are levelled and renovated with a home-made chain drag. Chains are welded to old 'Cat' blade runners and tightened with turnbuckles.

Levelling also helps to 'age' snow, making it easier to work and shape. Snow aging is a natural process that sees freshly fallen snow changes shape and density, over time. Artificial or mechanical aging speeds up this process, encouraging snow to sinter, or set up. When implements (including levelers) pack and mix snow, air space is reduced between crystals, encouraging them to bond more readily with one another.

More aggressive levelling implements can also be used to renovate old, packed trails. Sometimes considered a separate technique, renovating is really just the opposite process to packing and aging. Trails that become hard due to skier traffic, weather conditions or over-grooming need to be loosened or renovated before tracks are re-set. Often tracksetters equipped with precutters (see Section 4) are able to renovate the trail enough to allow tracks to be set. Alternately, multiple passes with renovating levelers – really aggressive levelers that are equipped with teeth that tear into icy and packed snow – may be required to dig deeply and mix fresh snow and/or buried snow into the dense upper snow pack.

The adjustable teeth on this *Renovating Leveller* can cut into hard trail surfaces, or, when raised, allow packing and levelling of light, fluffy snow.

The Tools – After the track-setter, a drag leveller will likely be your most valuable grooming tool. Levellers can take the form of bed springs, crusher screens, chain-link fencing, or other home-made devices. Commercial levellers such as Advance Tracksetting's *Renovating Leveller,* or Yellowstone Tracksetting System's (YTS) *Compaction Drag* can be purchased, or improvised in a

welding shop. For deep, aggressive renovating, Tidd Tech's *Track Tenderizer* and YTS's *Ginzugroomer*, equipped with vertical blades, have a solid reputation among professional trail groomers.

As mentioned above, drag levellers tend to bog down in heavy snow. Under such conditions, trails may need to be pre-packed before levelling. On wide trails, it might be advisable to groom the sides before dragging the centre, to keep as much of the snow as possible on the trail.

Ski clubs with dedicated trails for skate-skiing (see introduction for notes on skate skiing) use a skate lane drag for both packing and levelling and to leave a smooth, combed finish on the trail surface. Commercial skate-lane drags have a plastic 'comb' that leaves a rilled pattern in the snow. Home-made skate lane drags, often made from dimensional lumber (4x4s, for example) will also level and set a nice skate lane. Trail finisher combs can also be purchased by the foot and attached to home-made drags (see retailers, below). Skate lane dragging is the final step in skate trail grooming. Tracksetting, the next chapter, applies only to classic skiing.

A skate lane drag (this one made by Advance Tracksetting in Spruce Grove, Alberta) can pack, level and leave a combed surface on a trail.

Technique and Tips-. Renovating and levelling drags require substantial pulling power. A related problem, heavy loads tend to transfer weight to the rear of the snowmachine which lightens the skis and makes it difficult to turn, especially on steep uphills. Some groomers install hitches that raise the tow angle or more evenly distribute weight over the skis. Adding weight to the front end should also help improve steering when dragging a heavy levelling implement.

4 Track-setting

The Process – Like icing on the cake, tracksetting is usually the last, and sweetest, step in the whole process of trail grooming. After packing and levelling, the trail is now ready for tracks. Classic ski tracks are essentially parallel grooves left in the snow by weighted moulds – a tracksetter. Generally, tracks are set following major snow falls. It is relatively easy to set tracks in freshly fallen and packed snow. Setting tracks on densely packed trails with little or no fresh snow is more difficult and may require extra weight on the setter and/or deep renovating (see Section 3) to scrape packed snow before tracksetting.

One Pass Grooming: the Norman Wells Ski Club groomer drags a 'bed-frame' leveller and track-setter in tandem. The snowmobile does the packing.

In any case, tracks will need some time to set up before they are skied on. The time required will vary with temperature and humidity, but a couple of hours will usually do. Some groomers are often able to combine packing, levelling and tracksetting in one, neat pass. If separate grooming passes are required, setting should be done soon after packing and levelling, before the snow hardens. As with packing and levelling, tracks should not be set in extremely warm conditions.

Normally, old tracks need to be removed before new tracks are set. For this reason, it is important to have a grooming plan in mind for your trails to avoid setting tracks over top of each other, or a tracksetter with moulds that can be lifted off the snow.

The Tools - Tracksetters range from a very simple weighted pan to sophisticated hydraulic units. Commercial setters can be purchased from the dealers listed at the end of this guide. Serviceable tracksetters can also be made in a welding shop or even from wood (see FAQs – homemade tracksetters). Some things to keep in mind when buying or building a tracksetter include:

a) Weights – Removable weights will allow a groomer to increase or decrease pressure on the snow, according to the conditions. For instance, deep tracks are not suitable for early season snow packs. On the other hand, more weight will be required for tracks to be

This homemade tracksetter holds an assortment of weights

set in dense, well-packed snow. Weights can take the form of steel plates, concrete blocks, lead (car batteries), rocks, sandbags or even people (an easy 150-200 lbs). On average, tracksetters require 200-300 lbs of weight. Be sure that your weights are secure and won't fall off or slide around as shifting weights can result in uneven track compression and a badly set track.

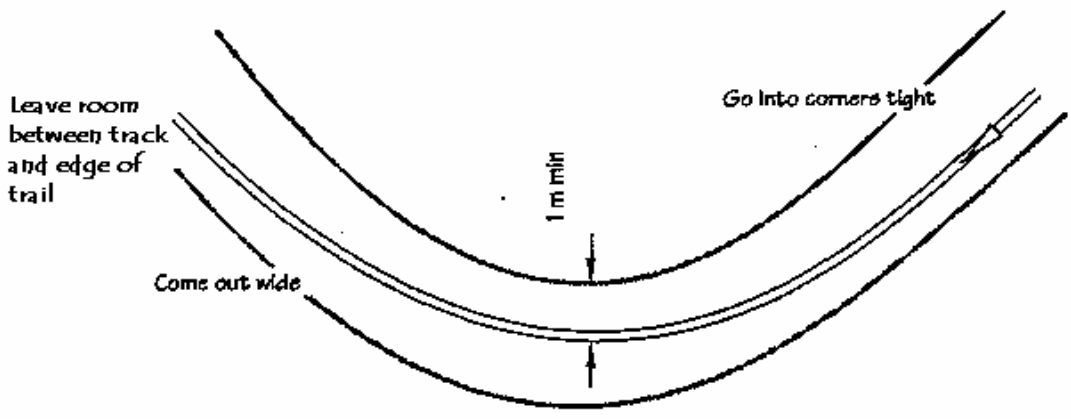
b) Track Removal – Some commercial tracksetters have moulds that can be raised or lowered depending on the trail requirements. For example, hills that a skier cannot climb in tracks, or sections of a trail that overlap. A lever lift tilts the pan so that the moulds are raised off the snow. More expensive tracksetters have electric lifts that raise the moulds with a switch. Still other tracksetters are equipped with flip-down rakes that remove freshly set tracks behind the pan; a garden rake would also do the trick. Track removal is not an absolute necessity.

c) Precutters – It can be difficult to set tracks in dense snow. Many tracksetters are fit with metal precutters that slice and re-direct snow towards the track moulds, acting like mini renovators on the underside of the tracksetter. Homemade units may have short sections of angle iron bolted in front of the setting moulds that serve somewhat the same purpose. When trails become extremely dense, it may be necessary to use renovating levellers on the entire width of the trail.

Technique and Tips- Novice groomers might find it difficult to set straight tracks at the low speeds required for quality tracksetting. Aiming at a fixed point down the trail will help to maintain a steady path on straight stretches of trail.

It is also a good idea to leave room beside the tracks (0.5m or 2ft) for skiers to pole and pass. This is especially true on downhill sections. The general rule for setting downhill curves is to go into the corners tight (toward the inside), but to come out wide, though not so wide that tracks are set on the very edge of the trail. Skiers need room to fall, too.

Ski clubs often set teaching grids for beginner skiers. Relatively short sections of 3-5 parallel tracks, teaching grids are wide, flat and straight. Use the first, straight track to guide your snowmobile as you set your next tracks, about 4 feet apart from each other.



An ideal downhill track: a long turn with room on the sides for stepping out, snowplowing or falling

f a.q.s

1) When should I groom?

There are a few answers to this question. In terms of safety, you should groom when skiers aren't on the trails – often at night or early in the morning. Also, because tracks need time to set up – about 1 to 2 hours - before they are skied on, it is best to groom at un-popular ski times. In terms of weather, it is best to groom at temperatures just below freezing (0 to -10 C). These temperatures are rare during an NWT winter and while packing at colder temperatures won't be as productive, it won't do any harm, either.
On the other hand, it is best not to groom trails when snow is warm and wet; leave it alone until there is a drop in both temperature and humidity.

2) Where can I get more information about tracksetting?

Cross Country Canada (CCC) has produced a couple of documents on trail grooming and track setting that were used to produce this NWTRPA guide. While the CCC Trail Grooming and Tracksetting Manual is officially out of print, the Trails Coordinator can likely find you a copy of the manual and accompanying video. CCC's current Officials Manual does contain information on snow physics and track setting specifications and can be found at:

http://www.cccski.com/downloads/Competition_Officials_Manual_v3.2.pdf

As well, Advance Tracksetting provides some basic tracksetting information on its website (see below) some of which was incorporated into this guide.

Perhaps the most useful tracksetting resources are the folks who are actually doing it around the NWT. Contact the Trails Coordinator for a list of local contacts.

3) Where can I purchase tracksetting equipment?

ADVANCE TRACKSETTING SYSTEMS (www.advancetrack.ca)

The owner has been a snowmobile groomer at the Strathcona Wilderness Centre, east of Edmonton, for several years. They offer a small line of simple, but useful grooming drags and tracksetters. Since they are Canadian, their pricing is in Canadian dollars – a significant cost advantage.

FIRST TRACKS (www.jacatrax.com)

The Canadian distributor for JACA tracksetting equipment.

MOUNTAIN SNOW EQUIPMENT INC. (www.mtnequipment.com)
A Quebec firm which produces a line of grooming drags for snowmobile and ski trails.

SNOWGROOMERS.NET (www.xcskigroomers.com)

This company sells a line of lightweight drags and tracksetters which it claims can be used with lighter snowmobiles.

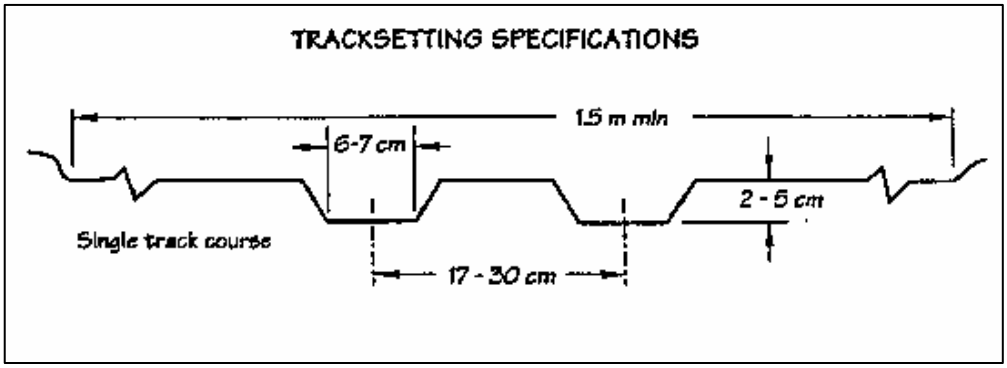
TIDD TECH LTD. (www.tiddtech.com)

One of the old timers; started twenty odd years ago in New England, now based in Colorado. Producers of the "Trail Tenderizer" and the new G-2, plus a line of accessories.

YELLOWSTONE TRACK SYSTEMS INC. (www.yellowstonetrack.com)

Doug Edgerton has long sold one of the most complete lines of snowmobile grooming and tracksetting equipment available anywhere. Especially interesting is the new "Ginzugroomer".

4) How can I make my own tracksetter?



The track diagram, at right, shows a range of measurements for the depth and width of tracksetting moulds. In the past, narrower tracks have been set for women and children. More recently, however, tracksetters tend to use standard moulds (that can be purchased from the above retailers) at standard widths.

Below are measurements and details for a simple, wooden tracksetter and a steel, YTS tracksetter with pre-cutters and stabilizers.