

# **BEST MANAGEMENT PRACTICES FOR ADAPTIVE TRAIL GROOMING**



**By Trails Work Consulting  
For the American Council of Snowmobile Associations**

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# BEST MANAGEMENT PRACTICES FOR ADAPTIVE TRAIL GROOMING

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## ACKNOWLEDGEMENTS AND DISCLAIMER

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All project management and writing was provided by Kim Raap – Trails Work Consulting. Mr. Raap has worked with snowmobile trail grooming management since 1978. He founded Trails Work Consulting in 2004 and developed the widely used *Guidelines for Snowmobile Trail Groomer Operator Training – A Resource Guide for Trail Grooming Managers and Equipment Operators* for the International Association of Snowmobile Administrators (IASA) in 2005. In 2006 he developed a series of over 500 Power Point training slides to accompany the groomer operator training guide. He works extensively with snowmobile trail groomer operator training across the U.S. and Canada and recently developed a new Power Point training program, *Top Tips for Effective Trail Grooming*, for use by local trail grooming programs. It is available at [www.snowmobileinfo.org](http://www.snowmobileinfo.org).

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# BEST MANAGEMENT PRACTICES FOR ADAPTIVE TRAIL GROOMING

## INTRODUCTION

Snowmobile trail grooming most commonly involves using a tracked groomer to pull a drag which has cutting blades and a packing pan to mechanically produce a smooth over-snow trail surface. In deep snow areas, snowmobile trail grooming may also be performed with a tiller mounted on the rear of a tracked snow cat. Groomed snowmobile trails create a more enjoyable experience for snowmobilers and help extend riding opportunities later in the season. The firmly compacted trail base created by grooming also helps trails withstand heavy snowmobile traffic.

Trail grooming has changed significantly since initial trails and grooming programs were established decades ago. Snowmobile tourism has grown, bringing higher user expectations and requirements. At the same time trail grooming equipment and operating costs have also increased dramatically compared to costs in previous decades. Consequently grooming management in today's operating atmosphere requires more adaptive approaches to be most responsive to increased needs, expectations, and costs.

Snowmobile trail grooming ranks as one of the most expensive types of recreational trail maintenance since it generally requires frequent restoration of the trail surface on a daily to weekly basis. Grooming efforts must be closely managed since trail conditions are heavily effected by weather conditions that can be wide ranging and include varying snow depths, new snowfall amounts, winds, extreme temperature fluctuations, freeze-thaw cycles, and sometimes even rainfall. Trail terrain, varying traffic volumes, and differing local use patterns all combine with those variant weather conditions to compel flexible and adaptive management decisions if grooming efforts are to be effective.

Trail grooming generally consumes the largest amount of snowmobile trail programs' operating budgets. The cost of operating grooming programs today is so significant that grooming efforts must be managed much more holistic – more so as regional business operations rather than fragmented local efforts – if they are to be most cost effective and efficient. While grooming management decisions must ultimately be made at local levels commensurate with local snow and use conditions, the following Best Management Practices (BMPs) are offered to help guide local grooming management decisions.



Photo 1: Grooming with a drag near McCall, Idaho

## OVERALL TRAIL GROOMING OBJECTIVES

Snowmobile trail grooming helps provide an improved level of access for snowmobile riders. But if done poorly or inconsistently, it can create safety issues for snowmobile riders. Trail grooming management should focus upon three primary objectives:

1. Providing a smooth trail surface that creates a more enjoyable experience for snowmobilers. This is done by:
2. Creating and maintaining a firmly compacted trail base that helps withstand heavy snowmobile traffic and provides extended riding opportunities.
3. Trail managers must provide an appropriate level of grooming repetitions that initially establishes a firm trail base in a timely manner at the beginning of the season – and then provides an appropriate frequency of grooming repetitions, commensurate with area traffic and snowfall patterns, that helps maintain enjoyable riding opportunities throughout the snowmobiling season.

## FLEET MANAGEMENT

The following factors should be considered for establishing and maintaining an effective trail grooming fleet:

**Miles/kilometers of trail coverage per groomer** – Groomers need to be utilized to the greatest extent possible to help justify their high cost and relatively short annual use season. Consequently the total number of groomers in a fleet should be generally be managed so that each groomer services an average of no less than 60 miles (95 kilometers) of trail, up to a maximum average of about 95 miles (155 kilometers) of trail, to best maximize groomer use while providing dependable grooming coverage.

Exceptions below 60 miles (95 kilometers) per groomer should generally only be allowed when total trail distance in an area is below this threshold, or when real topographical barriers such as water hazards prevent connectivity to more trail distance. Exceptions above 95 miles (155 kilometers) of trail per groomer can be acceptable on trails where traffic volumes are low with infrequent changes in weather patterns, or when the trail area being covered by the groomer is located in a low snowfall area with a short operating season.

**Equipment turnover / replacement schedule** – Grooming fleets are most effective and dependable when equipment is not allowed to age excessively or acquire an excessively high number of use hours before being traded or disposed of. Large groomer fleets are most effectively managed when the average groomer stays in the range of being about 5 years old with 2,500 hours of use. Individual groomers should be considered for trade-in once they have 3,500 hours of use since maintenance costs generally begin to increase more after this threshold. In no case should individual groomers generally be allowed to exceed 10 years of age or 5,000 hours of use.

**Grooming Equipment Selection** – good grooming starts with selecting the right equipment for the job. Equipment that isn't properly suited for an area's grooming needs produces lesser quality trails and ends up increasing overall costs. Grooming equipment represents a significant investment of dollars, so wise acquisition strategies



Photo 2: Compactor bar/drag combo example in the Sierra Madre Mountains, WY

that maximize grooming program assets should be followed. Consider the following factors to help ensure grooming equipment is best suited for its area of use:

**Groomer/Grooming Tractor selection:** the groomer (also referred to as grooming tractor in some areas) provides the power to pull the grooming drag, so it is critical that both implements are properly matched to one another. Consider the following factors to select the correct groomer for your area:

1. **Power to pull the right size drag:** underpowered units struggle to do the job while increasing operating costs due to over-working the vehicle; overpowered units can cost more than what is needed to do the job while also having higher than necessary operating costs. Groomers with low horsepower need to be matched with narrower grooming drags.
2. **Width, Height and Weight limitations:** the unit needs to be able to fit through the narrowest and lowest clearing widths along the trail system while not being too heavy for bridge weight limits. The unit's track width should never be wider than the grooming drag or tiller it pulls since this creates poor trails due to inconsistent compaction at the outer trail edges.
3. **Flotation in snow:** the unit needs to have a low PSI ('pounds per square inch' of downward pressure) to ensure it can stay on top of snow rather than having so much weight and poor flotation that it burrows through snow. Heavy groomers with high PSI tend to disperse snow off the trail where it is wasted by the unit's burrowing action.
4. **Ability to turn and climb while pulling heavy loads:** this is especially critical if the trail system is not entirely flat and straight. Hills and curves typically need the most grooming work to repair moguls and cover bare spots so the groomer must be able to maneuver well while staying under full power and fully engaged in grooming efforts.
5. **Front Blade:** a groomer should always have a front blade to properly keep snow piles cleared from road and driveway crossings, for dozing snow drifts, working down curves, filling creeks and depressions, and working new snow into the trail from along outside trail edges.
6. **Ease of operation:** can the unit be easily operated by your authorized volunteers or employees?
7. **Maintenance needs:** can the unit be easily maintained and/or repaired by your volunteers or employees, or does it require that most work be done by authorized service technicians?
8. **Parts availability:** Are replacement parts readily available in your local use area in a timely manner to minimize downtime, and at a reasonable cost?
9. **Purchase cost:** this should be the least important factor since improper equipment can ultimately drive operating costs up and result in poor grooming dependability and performance. The answers to factors 1 through 8 above are ultimately what should determine whether a groomer unit can properly cover your area's grooming needs, or not. If cost precludes buying the right groomer, opt for used versus new or 'older used' versus 'newer used' to get the right equipment for the area rather than buying the wrong groomer that could likely cost you more in the long-term – while also not being most effective for your area's grooming needs.

**Grooming Drag selection:** the vast majority of the real 'grooming work' is done by the drag which cuts moguls, processes the snow, redistributes it into an even surface, and then leaves the trail surface evenly compacted to refreeze. A drag is an extremely important implement in the 'grooming toolbox' – even in areas which primarily groom with a tiller – since it provides superior trail processing and hardening effectiveness. Consider the following factors to select the right grooming drag for your area:

1. **Match the groomer's size:** the drag size must match the groomer's overall horsepower as well as its overall width. Wide and/or heavy drags require higher horsepower groomers, so they can quickly increase operating costs. Safeguard against choosing larger groomers and drags than what are needed to properly maintain your area's trails (larger does not necessarily mean proper or best).
2. **Processing ability:** the unit should have multiple cutting blades for cutting and processing the snow trail. Snow must roll and churn freely within the drag for proper processing while also preventing snow spillage outside the drag – since the goal is to increase snow depth on the trail. Consequently beware of having too few or too many blades, improperly spaced cutting blades, or insufficient snow storage

within the drag. The drag must be capable of working snow to the middle of the drag to address ‘hollowed out’ areas often caused by high traffic in the center of the trail. The drag frame must also be square and properly adjusted to ensure even cutting and compaction.

3. **Width:** the drag’s minimum width must be at least as wide as the groomer’s outside track width without being so excessively wide that it unnecessarily increases operating costs and necessitates wider trail clearing widths; its maximum width is dictated by the narrowest clearing width along the trail. The wider you groom a trail, the more you invite higher snowmobile speeds. Eight-feet, nine-feet, or no more than ten-feet wide grooming drags generally produce the best quality snowmobile trails.
4. **Length:** longer units generally produce smoother trails since this helps bridge high spots in the trail, but too long can limit the groomer’s ability to negotiate tight turns along the trail system.
5. **Weight:** while drags must be heavy enough to cut deep moguls, excessively heavy grooming drags quickly overburden the groomer’s pulling ability as well as increase fuel consumption, maintenance issues, breakdowns, and total operating costs.

**Add a Compactor Bar:** a compactor bar/packer bar (bar) is an important, yet generally underutilized grooming implement that all grooming programs should consider using during early-season trail opening and set-up to help reduce time, effort, and costs. A bar is generally low cost and provides a much better alternative to pulling heavy drags during trail opening and set-up when drags are often damaged, causing them to get ‘out of square.’ Advantages of using a compactor bar include:

- Light weight, short length, and much more maneuverable since it is mounted on the rear of the groomer versus pulled behind it.
- Sets a firm base ready for future grooming with a drag while potentially cutting the trail opening time period from many days to hours.
- Helps drive frost into the ground and freeze swampy areas.
- Reduces wear and tear on the groomer and the grooming drag.
- Dramatically reduces potential for ‘swimming events’ (groomers falling through the ice during early season trail opening) which are very costly.
- Can be used after heavy snowfall events, when the drag is too much of a load for the groomer to pull.
- Can be attached to the groomer simultaneous to when pulling a grooming drag – allowing the drag to be easily unhooked when there is a need for dozing work with the tractor’s front blade / compactor bar combination in heavily drifted or deep snow areas.



**Photo 3: Compactor Bar example**

**Capitalize on trade values** – The value of a good used groomer is usually very substantial. Its ‘trade-value’ should therefore always be treated as potential ‘cash value’ which can often help to significantly reduce the actual cash needed to buy its replacement. An exception would be when a unit has been kept for too many years and/or used too many hours – to a point where its value diminishes to no more than scrap metal or used parts value.

If the grooming program has a large fleet with multiple groomers, the best units should always first be considered for rotation or reassignment within the program’s overall fleet before being traded away. A used unit should always be traded or otherwise sold or disposed of when acquiring replacement groomers (unless the program is growing and adding trails). The overall fleet size should generally not be allowed to grow since this ultimately increases overall operating costs since keeping multiple ‘spare/back-up’ groomers is rarely cost effective.

**Evaluate lease versus purchase options** – Equipment lease options have historically been quite limited for new OEM (purpose-built ‘original equipment manufactured’) over-snow groomers due to limited alternate season (non-winter) use options. On the other hand, lease or rental options for agricultural/farm tractors seems to be growing in availability, but are largely dependent upon manufacturer or local dealership interest. Equipment lease or rental options typically cost more over the long-term but can provide an important alternate option when cash flow is insufficient for equipment purchase. All pros and cons should be closely considered – financially as well as the appropriateness of available equipment – before committing to a lease or rental program.



**Photo 4: Example of an agricultural/farm tractor groomer conversion**

**Evaluate contract grooming versus program owned-operated options** – Grooming programs in many areas utilize service contracts with clubs, private parties or businesses to provide trail grooming. Contract grooming may be a more viable option where the grooming manager lacks local infrastructure or labor to provide the required level of day-to-day operation and oversight. Contracts typically require specific equipment specifications and operating requirements. When the contractor provides all equipment it is important to provide multiple year terms (perhaps up to five year terms) to help capitalize equipment costs. At the same time it’s also important to have annual renewal provisions, at the option of both parties, to allow an escape clause as well as an ability for the trail manager to cancel due to nonperformance.

Most grooming contracts require the contractor to provide all required grooming equipment along with all operating costs (labor, fuel, maintenance and repairs, depreciation, etc.). In theory this approach also provides a margin of profit opportunity for the contractor. In another variation the grooming manager may provide the grooming equipment and major repair costs while the contractor provides labor, fuel, routine service and maintenance costs, and most importantly, the daily on-the-ground operation of all trail grooming logistics.

Contract grooming examples show that those contractors who provide all their own equipment and operating costs are often charging in a range between \$12 to \$20 (USD) or more per each mile of grooming (example: \$20 per mile per each grooming repetition) for their services – with average contract costs being much closer to \$20 per mile versus the lower end of the scale. In examples where the trail manager provides the grooming equipment (along with major repairs and off-season maintenance) and the contractor provides all labor, fuel, and routine service and maintenance operating costs – contract rates are averaging around \$10 (USD) per each mile groomed.

## **PROPER RECORDKEEPING**

Good recordkeeping is extremely important to the management of a successful grooming program. Grooming managers need to have a good grasp on past efforts to properly understand the full context of where they’re at today as well as where their program needs to be heading in the future.



Detailed recordkeeping should start immediately upon the acquisition of every piece of grooming equipment and follow through until its final trade or disposition. Detailed monthly logs that track daily use should be kept for every piece of equipment outlining date of use, begin and end times, total daily use hours and miles groomed, fuel consumption, and all maintenance and repair details (what was done) including the cost of all fluids, parts and other materials. Any data not captured by dependable electronic tracking systems should be kept manually.

Detailed records of use, off-season storage, maintenance and operating costs for each individual groomer should be compiled into monthly reports that are then summarized into annual area summary reports that provide a complete picture of area grooming efforts and costs. Area summaries should then be used (rather than put on a shelf and forgot) to help assess overall grooming penetration, efficiency, and effectiveness, as well as to consider future scheduling and budget adjustments.

Detailed inventory, use, maintenance, storage, and cost records should also be kept for all grooming drags since they are subjected to heavy use and are central to successful, top quality grooming programs.

All records should be kept on file for the life of the unit. If a unit is transferred to another area, all prior use records should be transferred with the unit to the new user. Detailed daily/monthly use logs could be discarded once a unit is disposed of by the local grooming program, but it's suggested that all monthly and annual use summaries be retained for at least ten years to aid grooming efficiency assessment and budgeting exercises.

## **OFF-SEASON GROOMING EQUIPMENT STORAGE, INSPECTION AND MAINTENANCE**

Proper off-season storage and maintenance of groomers is critical to reducing overall operating costs.

**Off-season groomer storage and inspection** – Groomers spend a significant part of the year sitting completely idle. They must be properly stored to help protect a very major investment in grooming resources. Always refer to the equipment manufacturer's storage recommendations, along with the following guidelines:

- Store the unit inside or out of direct sunlight if at all possible to prevent Ultra Violet (UV) light damage to rubber components such as tracks and hoses, as well as to help minimize damage from rodents. If stored outside, consider removing the tracks for inside storage. If not removed, the tracks and hoses, or entire vehicle, should be covered or wrapped with UV resistant material.
- Clean and service the battery and battery compartment.
- Change the oil, transmission fluid, hydraulic fluids, and all filters.
- Lubricate all grease fittings to displace water and spent grease.
- Check for wear points on the track belts and related components, wheel wear, cracks in carrier and frame, worn hydraulic assemblies, etc.
- Check engine compartment for potential wear, tension, and/or alignment issues on belts, pulleys, bearings, hoses, linkages, springs, wiring, mounting brackets, pumps, etc.
- Check drivetrain, differentials, transmission and engine for fluid leaks.
- Compile all identified issues and deficiencies into an inspection report that can be used as part of the off-season / pre-season maintenance checklist.
- Clean interior and exterior.



**Photo 5: Groomer storage building example**

- Recordkeeping should document where and how (inside or outside) the unit was stored.
- Engine should be started monthly and operated at least 15 minutes to help keep moving parts lubricated.

Don't forget the same storage and inspection needs for a grooming drag; its hydraulic hoses need UV protection and its moving parts and frame require maintenance to keep cutting and compacting properly.

**Off-season equipment maintenance** – Groomers and drags should always have maintenance and repair needs addressed during the off-season to ensure they are ready to go when first snowfalls arrive. If the off-season storage and inspection recommendations above have been followed, readying the unit for the start of a new season should be relatively easy, depending upon the amount of maintenance and repair needed to ensure the unit is ready. Always refer to the equipment manufacturer's maintenance recommendations while also following these universal guidelines:

- Refer to previous maintenance records and the storage inspection report to ensure all identified issues and deficiencies are addressed.
- Check and fill all fluid levels and look for signs of leaks.
- Install and/or adjust tension of all tracks.
- Inspect all welded joints and stress areas for cracks.
- Inspect all bearings, joints and other moving parts for wear.
- Check drag blades for proper adjustment and ensure the drag's frame is 'square' for proper cutting.
- Recordkeeping should document all off-season maintenance that is performed, including costs.

## OFF-SEASON TRAIL MAINTENANCE

The quality of a groomed snowmobile trail is directly impacted by the quality of the trail bed underneath it. If the ground or road beneath the snow surface is deeply rutted or rough, there will never be consistent compaction across the snowmobile trail's surface and consequently the snowmobile trail will be rough and moguled throughout the season. Off-season trail maintenance that addresses the following will improve winter trail quality and help reduce grooming costs:

- Remove holes, ruts, rocks, stumps and debris along the trail bed to help improve uniform snow compaction.
- Remove brush and tree limbs along the trail to prevent equipment damage and to help more snowfall reach the trail.



**Photo 6: Off-season trail maintenance example**

## MANAGING GROOMING OPERATIONS

Key considerations that grooming managers should pay close attention to in order to improve overall grooming efficiency and effectiveness include:

**Create more opportunities for grooming loops** – One of the greatest grooming inefficiencies is due to having deadhead grooming trails (must go over the same trail twice in order to groom it) versus having trails that can be groomed in a loop with only one grooming pass. Grooming managers should continually look for ways to create more loop grooming opportunities in order to become the most efficient and cost effective.

All too often historic club boundaries (which are artificial, politically created boundaries) create deadheads that could be more efficiently groomed as a loop if the political boundary was not unnecessarily preventing it. Grooming managers should consolidate and redefine artificial boundary obstacles to the greatest extent possible to be most efficient and cost effective, ultimately helping their grooming program survive better into the future.

Some deadhead grooming is caused by real geographical obstacles like bodies of water, rough terrain, etc. that cannot be avoided – so is an inefficiency that simply must be accepted. However, in the case of other deadheads not caused by real geographical obstacles, grooming loops can sometimes be created by adding new trail segments that either shorten a deadhead or complete a loop. While this type of trail expansion may take lots of time, money and/or coordination, such efforts can prove to be very worthwhile over the long-term – particularly since added trail distance can often result in the same or less total grooming distance once a deadhead is shortened and loops are created.

**Weekly scheduling** – The number of weekly grooming repetitions (grooms) on each trail segment is an important indicator of potential trail quality. While more grooming repetitions per week should generally result in better trails, that’s not necessarily always the case – particularly if the timing of repetitions is not spaced correctly in respect to trail use. Grooming managers should generally try to focus grooms directly in advance of and after peak use days. The busier an area is, the more important that grooms be scheduled to maximize trail setup time – because if you’re grooming when snowmobilers are riding directly behind you and during needed setup time, you’re wasting time and money.

High use areas should likely be grooming five to seven nights per week to be most effective, while low use areas can often survive with grooming only one or two nights per week once the trail becomes established. The key is for grooming managers to stay engaged with monitoring weather and traffic patterns – and to either regularly get out on the trails themselves to monitor conditions first-hand and/or have dependable ‘eyes and ears’ they can trust for credible feedback from those regularly riding their trails. And just because a groom is scheduled for a

particular night does not always mean the groom should occur if the trails are in great shape; instead save money for when it’s really needed. The same is true when trails become rough and no grooms are scheduled – adjust the schedule and get the groomer out if at all possible since the longer you wait the more trail quality will continue to deteriorate. Once you fail to keep up, the trails will likely remain rough and less enjoyable for the remainder of the season.



**Photo 7: Grooming with a tiller near McCall, Idaho**

While additional weekly grooming repetitions may cost more money, it doesn’t always have to. Managers should first use adaptive scheduling to address anticipated and unanticipated needs with the following process:

- 1) Outline a general season-long schedule that balances the overall grooming operations budget with the anticipated number of grooming weeks and the number of hours typically required to complete one groom of all trails in the area.
- 2) Then outline a general weekly grooming schedule that considers differences in trail opening, peak holiday time periods, and historically slower versus busier use weeks.
- 3) Consider holding back a small contingency at the beginning of the season for unanticipated supplemental grooming needs; as the season progresses monitor conditions to balance whether contingency funds / grooming hours should be reallocated or continue to be saved.
- 4) Continue to actively manage the weekly grooming schedule, being adaptive to changing needs by adjusting (canceling or adding grooms) to best utilize available grooming resources.

And in the end, buying more fuel to operate an existing groomer more hours is one of the least expensive parts of the overall grooming cost equation. Keeping trails smooth and enjoyable should be the most important objective.

**Be adaptive to different grooming situations** – Grooming managers and groomer operators must be adaptive to changing conditions and recognize that there are generally four different grooming situations that require grooming method adjustments:

**Start of season:** trail opening at the beginning of the season is one of the most important ingredients for a successful grooming program, so it's important that it's done properly and in a timely manner before too much snow accumulates. It can also become a big cost event if done improperly.

The first snowfalls create the base layer that must be used for the rest of the season, so establishing a smooth, solid base early is extremely important for helping keep the trail in good condition throughout the season. On the other hand, an early rough, poorly compacted base will haunt you all season – ultimately creating more work, poor trail conditions, and increased costs. Consider the following to reduce costs and improve season-long trail durability:

- Compaction of the base layer of snow should generally have started by the time the first foot of snow accumulates on the trail to ensure good compaction from the ground up (this will vary and be affected by the type of terrain and vegetative cover underneath).
- Consider using a compactor bar instead of a grooming drag the first pass or two over the trail system. This will generally be faster, less costly, save wear on the drag, help drive frost into the ground, and freeze swampy ground faster.
- In swampy areas and seeps, keep snow thickness to a minimum in the early part of the season so the underlying soil can freeze and become stable; this frozen layer of earth will then help keep the trail solid later into spring. Keep the trail covered with only a thin layer of snow once the wet area is frozen to best prolong trail life.
- Operate at much slower speeds early in the season to help avoid, or at least minimize, equipment damage from hitting hidden hazards not yet sufficiently covered by snow.
- When using a drag early in the season, it is often better to 'ride the pan' versus trying to cut much with the drag's blades on initial passes in early or low snow conditions. Getting too aggressive can damage the drag as well as dig up dirt or gravel that contaminates proper compaction of the snow base.
- If a trail must cross frozen bodies of water (not recommended with a groomer), be absolutely certain of ice thickness, potential water depth if the groomer falls through, and water currents beneath the ice. Always check conditions by foot or with an ATV or snowmobile before the first crossing by a groomer. Beware of changing conditions and consistently monitor the crossing site closely. If possible, use a smaller, lighter vehicle with compactor bar initially instead of a large groomer with a heavy drag. Far too many groomers are sent 'swimming' – which become very expensive cost events – due to operators failing to know their trails and failing to properly check ice conditions. If you don't know – don't go.

**Regular (engaged) grooming with mogul removal:** trail grooming with a drag is about processing and mixing snow particles and it requires that snow always must be carried and worked within the drag to be effective. It often requires deep cutting to bring the trail back into a smooth, firm surface after snowmobile traffic has destroyed the trail base. There are four important steps that must always be followed for success:



**Photo 8: Grooming with a drag near Mt. Carleton, New Brunswick**

1. **Removal of moguls** – the entire mogul profile must be completely removed without excessively cutting into the trail base below the mogul’s ‘dip.’ Cutting off just the top of the mogul and rolling it into the ‘dip’ (cut and fill) is unacceptable since it leaves a ‘memory’ of different snow densities within the trail, causing a freshly groomed trail to quickly deteriorate due to the inconsistent density.
2. **Processing the snow** – a rolling or churning action within the drag’s blades is required for correct processing. This de-aeration process helps make the snow denser and helps break away points on snowflakes for better bonding of snow particles. The most effective processing speed is 5 to 7 miles per hour (8 to 11 kilometers per hour). Grooming faster can create a rocking motion in the drag and leave a rough trail. It can also prematurely wear snow out and be a huge waste when snow is sprayed out of the drag and squandered off the trail. Most importantly, snow doesn’t have time to properly roll and process when the grooming drag passes over the trail too quickly. Example: the widely used Mogul Master Model 18-09 drag has a working area that is 18-feet long; a grooming speed of 5 to 7 mph (8 to 11 kph) equals 7.3 to 10.3 feet per second – meaning it takes about two seconds to travel an entire drag length. When the grooming speed is increased to only 10 mph (16 kph), the travel speed equals 16.7 feet per second – meaning the time available for the drag to process snow is cut almost in half, allowing only about one second for the drag to do its work. And if your drag is shorter than 18 feet long, available processing time is even less.
3. **Compression of the processed snow** – the loose snow created by the cutting and churning action of the blades is distributed by the spreader pan and then compressed into a new layer of compacted snow on the trail bed. The snow is further deaerated by this step into a more uniform, smooth surface while also increasing the trail’s overall depth.
4. **Trail setup** – this final step requires allowing the snow which has been disturbed by cutting, processing, and compressing sufficient time to refreeze. The more setup time that can be provided before the trail has snowmobile traffic over the freshly groomed trail, the more durable the trail will be. Consequently night grooming is generally best since it typically provides lower temperatures and traffic levels. Since setup can require two to six or even as much as ten hours for the trail to fully refreeze, grooming managers may have to continually adjust grooming start and end times to best maximize potential setup times in accordance with their current weather and traffic trends.

**Re-establishment of trail after heavy snowfall or winds:** when deep, fresh snowfall or wind drifting covers moguls on the trail, it may not be possible or practical to completely remove moguls. This can mean starting over in establishing a good, firm trail base. In this situation it is important to give extra attention to compacting a new, hardened trail base in an effort to ‘cap’ the profile of old moguls below the new layer of

deep snow. This requires slowing down, ensuring that the drag is doing a good job of processing the new snow (deaerating it and making it denser) and then also focusing on good compression with extended trail setup time. Oftentimes it is beneficial to delay grooming a bit until after snowmobile traffic has first had a chance to beat the deep new snow down – which actually helps start processing and deaerating the new snow, allowing the first grooming pass after the snowfall or drifting event to be much more effective.

**Light maintenance with minimal cutting:** light trail maintenance means grooming when trails are relatively smooth. On one hand this type of grooming should be minimized since it means trails are generally in very good condition, so grooming is somewhat a waste of time and money. On the other hand this situation can occur on portions of a trail system which must be traveled in order for the groomer to get to other trail segments in worse condition and in need of more heavily engaged grooming. When doing light maintenance grooming, be careful to not set the drag’s cutting blades too low on smooth or generally smooth trails (no deeper than the bottom of a mogul’s ‘dip’) to avoid destroying well compacted trail base. Generally use only the rear set of blades to ‘skim’ the trail; this will keep a minimum amount of snow ‘working’ within the drag to help build trail base as well as restore the trail surface which is churned up by the groomer’s tracks. Light Maintenance is typically when many groomer operators increase their speed above – and sometimes substantially above – recommended grooming speeds. While an operator can sometimes fudge a bit on maximum top speed in these conditions, close attention must always be paid to whether the tracks and drag are throwing up/out an excessive amount of snow dust – and therefore wasting snow off the trail – and to whether the drag starts bouncing around, leaving an uneven trail surface. While grooming time may be gained for the short-term, high speeds often end up costing the grooming program more over the long-term in fuel and maintenance costs.

## CONTROL WASTEFUL GROOMING PRACTICES

The four most typical wasteful practices by grooming programs include grooming too fast, maintaining too wide of a trail, over using a groomer’s front blade, and failure to remove the entire mogul when grooming rough trails. It is important that grooming managers provide proper instruction and oversight to groomer operators to prevent or at least minimize these grooming abuses since they ultimately increase grooming costs and decrease overall trail quality and durability.

1. **Control grooming speed:** grooming too fast is universally the leading wasteful habit in grooming programs. Snowmobile trail grooming is slow, tedious work required by the fact grooming drags rely on gravity and physics rather than automated mechanical manipulation (such as processing done by a tiller) to process the trail’s snow base and surface. There are no shortcuts.

As discussed above under ‘Processing the snow’ in the Regular (Engaged) Grooming section, the most effective processing speed is 5 to 7 miles per hour (8 to 11 kph). Groomer operators generally need to slow down to improve their effectiveness. A grooming drag cannot magically restore a rough trail simply by driving over it – it needs time to work the snow when trails are drifted, rough, and/or heavily moguled. Grooming too fast wastes snow by spraying it off the trail and increases operating costs due to higher fuel consumption and more maintenance required from increased wear and excessive vibration created at higher operating speeds.

2. **Control the groomed trail width:** grooming programs and groomer operators often maintain trails wider than needed, particularly when a snowmobile trail is located on a wide roadway or through open fields or meadows. As stated above under Grooming Equipment Selection, an 8-foot, 9-foot, or no wider than 10-foot wide grooming drag generally provides the best quality snowmobile trail at the most economical cost.

The MINIMUM groomed trail width should always be at least slightly wider than one drag width to help prevent the groomer from falling off the compacted trail base and becoming stuck. At the same time the MAXIMUM groomed trail width should never be more than twice the drag’s width to prevent creating soft, uncompacted pockets in the trail when multiple grooming passes don’t properly overlap side by side.

The IDEAL groomed trail width is 1½ times the drag width. This provides overlapped grooming coverage every grooming repetition in the middle third of the trail – which often gets hollowed out from being where many snowmobilers operate. This positioning also takes advantage of how the groomer’s tracks chew up the snow surface, helping start the processing process – and which can be particularly important when moguls are hardened. The effectiveness of maintaining a maximum groomed trail width of ‘1 ½ times the drag width’ is further enhanced when the grooming direction is reversed every other repetition (clockwise and then counter-clockwise) to provide two-way, multidirectional processing of the snow surface.

The benefits of grooming with narrower versus wider drags, and therefore preventing snowmobile trails from getting to be wider than needed for safe two-way traffic, can include:

- Better trails due to more focused and more uniform compaction
- Lower grooming costs due to using less fuel and less wear and tear on equipment
- Less overall trail maintenance since less brushing, trimming, widening, etc. is required
- Less labor required for trail maintenance activities like clearing and brushing, which is important with a declining staff and/or volunteer base in many areas
- Lower environmental impacts, which promotes better landowner relations as well as better overall public relations for snowmobiling

3. **Avoid over-use of the front blade:** far too many groomer operators overuse a groomer’s front blade. A smooth trail does not require the use of the front blade – ever – except if there is a snowplow berm at a road or driveway crossing, or a wind drift across the trail. Otherwise using the front blade on a smooth trail results in destroying well compacted trail base – or worse yet, dozing precious snow off the trail where it is wasted.

When grooming with a drag, the front blade on the groomer is generally best used *only* to level drifts or to pull new snow into the trail. The snow which makes up the trail base is then best processed, compressed, and leveled by the grooming drag. As much snow as possible should always be preserved on a snowmobile trail to increase its durability and longevity – so don’t defeat the purpose of grooming by dozing snow off.



**Photo 9: Example of improper front blade use on a smooth trail**

4. **Remove the entire mogul:** failure to remove the entire profile of a mogul (from the top of the mogul’s ‘mound’ to the bottom of its ‘dip’) leaves a ‘memory’ of the mogul due to a difference in snow density. ‘Cut and fill’ grooming – where the top of the mound is cut and rolled into the dip in an attempt to ‘fill it’ – is never an effective grooming method since moguls will always quickly reappear, resulting in wasted grooming efforts.