THE FOUR STEPS OF TRAIL GROOMING

The primary purpose of grooming is to remove moguls and compact the trail base. This is not simply a matter of knocking off part of one mound and pushing the displaced snow into the adjacent dip. A "cut-and-fill" grooming operation produces an uneven snow density that can result in a poor riding experience. Even though the trail may initially look smooth, the trail will most likely quickly revert back to moguls as the soft snow is pounded out of the filled dips by passing snowmobiles.

Four basic operations are required to produce a well groomed trail that is durable. They include: Step 1 – Removal of Moguls, Step 2 – Processing the Snow, Step 3 – Compression of the Processed Snow, and Step 4 – Trail Set Up. In most cases, grooming with a multi-blade drag will produce results superior to grooming with a single blade drag or a tiller since a multi-blade drag generally does a good job of accomplishing all four steps while a single blade drag or tiller accomplishes some steps better than others. For this reason, a multi-blade drag has been chosen to demonstrate the four grooming steps.

Step 1 – Removal of Moguls

Ideally, moguls should be completely cut away from the snow that forms the trail base. Beware that if the top is simply cut off a mound and dropped into the depression of the adjacent dip, it can result in the same mogul returning in no time at all. By completely removing the mound, all the way down to the bottom of the adjacent dip, the profile of the mogul is eliminated from the trail.

However, also beware to not cut into the layer of snow that forms the compressed trail base below the bottom of a mogul's dip. The mogul should be removed, but not the solid trail base below it, so care must be given to cutting no deeper than the bottom of the dips that form the moguls. This requires that the cutting depth must be continually monitored and adjusted by the Groomer Operator.

There may be limitations to successfully removing the entire mogul: 1) if there is bare ground showing at the bottom of the dips in the moguls, do not attempt to cut the whole mound off since it could damage the equipment and result in destroying whatever hardened trail base there is; 2) if using a single blade drag and the moguls are deep, it is likely that snow could be lost out the sides of the drag when cutting deep enough with the blade to successfully remove the entire mogul. In this situation it is better to "save" the snow on the trail base rather than spilling it out the side where it may be "lost" for the purposes of grooming; 3) if using a tiller, the front blade on the tractor is the most effective tool for mogul removal prior to processing the snow with the tiller. However this has limitations since it cannot duplicate the planer effect of a drag; and 4) if using a multi-blade drag, it will not cut any deeper than the depth that the planer blades extend below the bottom of the side rails of the drag when it is fully lowered. If the trail bed is soft, the side rails may cut into the trail bed. But if the trail bed is hard, the rails will typically ride on top and limit the cutting depth. In all cases, the goal should be to remove all, or as much of the mogul as is reasonably possible, to produce a trail that will stand up better to snowmobiling traffic. Oftentimes, multiple grooming passes may be required to achieve this.

Multi-blade drags accomplish mogul removal by using multiple sets of planer blades angled to cut *into* the moguls. As shown in Figure 1.6, the preset cutting depth of the planer blades are typically stepped slightly lower from the front to the rear of the drag, which results in the deepest cutting depth when the drag is fully lowered so it rides flat on the side rails. Again, if the depth of the moguls exceeds the depth of the drag blades, multiple passes may be required to accomplish complete mogul removal.

When deep, fresh snowfall covers moguls on the trail, it may not always be possible or practical to completely remove the moguls. In such a case, it is critical that extra attention is given to Steps 2, 3, and 4 outlined below since a new, hardened trail base must be created to cover the profile of old moguls below the new layer of snow.

Step 2 – Processing the Snow

At any given time, there may be several types of snow on a snowmobile trail – hard packed snow, soft snow, wet snow, dry snow, ice, freshly fallen snow, wind blown snow that is typically small granules and some of the hardest snow, or snow that has been pounded by snowmobiles and worked so hard by groomers that there is little consistency left in it. It is critical that all types of snow be "processed" to achieve proper trail compression and set up.

Snow processing is accomplished by the establishment of a rolling or churning action in front of the blades as they move forward at a correct and constant speed. In many drag designs, the multiple blades are angled so the snow moves from side to side further mixing and homogenizing it. While the snow is being mixed, it is also de-aerated (air space between snow particles is removed to make it denser). When using a single blade drag, it is critical that this rolling action is achieved since there is only one blade/one shot at properly processing the snow. While a tiller does an excellent job of processing snow, it can be limited by the depth of its tines. This churning, tumbling, or milling action removes air from the snow and, at the same time, breaks up the compacted snow from which moguls are formed into smaller granules of various sizes. It also breaks away points from individual snow flakes so they can be compressed more tightly.

The mechanical action of the churning and tumbling has another important purpose in that it can sometimes introduce moisture into the snow mix due to friction. This friction causes the temperature of the snow to actually rise, be it a very small fraction of a degree, which can create a small amount of moisture in the processed snow. This is especially valuable when snow is very dry. Introducing this moisture into the processed snow is also very important to the success of Step 4, achieving good trail "set up."

It is critical that the rolling or churning action is achieved. If snow is allowed to ball up or plow along in front of the blades without this rolling action, the snow is not being properly processed (doesn't de-aerate, doesn't mix and break points, doesn't produce friction). This can be caused by the tractor traveling too fast (not enough time for the snow to properly roll and process), grooming conditions being too warm or too wet, or improper drag blade height (set too deep if "plowing" or too shallow if no snow in blade).

The height of the drag's blade(s) is critical to proper processing of the snow. If the trail is fairly smooth or only slightly moguled, only a minimum of snow will need to be processed since it isn't desirable to disturb any more of the trail base than what is needed to remove the moguls. In such cases, there may only be a need to have snow churning in the rear sets of blades on a multi-blade or only a partial blade full on a single blade. If the trail is heavily moguled or if there is lots of new snow, more blades on the multi or greater depth on the single blade will likely be required. Remember – process only as much as is needed to remove the moguls, but no more.

Proper ground speed is also critical to proper processing of the snow. Too slow and the proper churning, rolling, and mixing to produce the friction that is needed to improve trail set up is not achieved. Too fast and several factors work against effective grooming, particularly with multi-blade drags. First, too high of a ground speed results in the angled blades spraying snow out the sides of the drag where it is lost and wasted for the purposes of grooming. Snow is precious to the grooming operation and most areas can ill afford to deliberately throw it off the trail. Second, the rolling and churning action is partially dependant upon forces of gravity, so proper time must be allowed for the snow to roll, churn, and fall out. Third, going too fast can sometimes, in effect, over-process the snow and prematurely wear it out. Processing snow can be similar to using a blender – low to mid speeds can achieve good mixing and blending, but setting the speed too high can actually start to change the consistency and even liquefy what's being processed. The same can be true with grooming in that the quality of the snow can actually be adversely affected by going too fast. And fourth, regardless if using a single blade, multi-blade, or tiller to groom, too high of a ground speed results in a side-to-side rocking that produces a rough versus smooth finished trail. Irrespective of the type of groomer, the best quality trails, in terms of both smoothness and durability, result from grooming at speeds between 5 and 7 miles per hour.

After the processed snow passes through the last set of blades or the tiller, there should be an even blend of loose particles ready for compression.

Step 3 – Compression of the Processed Snow

The moist, loose snow created by the processing step must be "compressed" into an even covering of uniform density with a smooth surface. This process further de-aerates the snow and provides for a denser trail surface. As shown in Figure 1.8, this step is accomplished by a flat packing/compression pan at the rear of the drag.

On a multi-blade drag, the front of the pan is angled so loose snow that is contained by the side rails is captured and pulled under the spreader pan where it is then compressed by the weight of the moving drag. Since single blade drags typically do not have side rails, the snow must pass under the single blade of the unit and then be compressed by the drag's pan. If too much snow is carried in the single blade, it spills out the sides. This difference means that the multi-blade typically increases the finished snow depth/base of the trail with each pass, while the single blade increases trail depth only when there is an accumulation of new snow on the trail. While a tiller can apply down pressure when processing the snow, there is typically very little compression and generally is only from the unit's plastic comb.

Step 4 – Trail Set Up

Set up is simply allowing the snow that has been disturbed by cutting, processing, and compressing the proper time required to refreeze. Generally, the longer the set up time that is allowed, the more durable the trail will be and the longer the newly created smooth surface will last.

Once the drag or tiller has passed, the snow from the moguls should have been fully removed, processed, and redistributed as a new layer of denser, smoother "snow pavement."

The last step in the grooming operation allows the moisture that was created during the processing step to refreeze. This binds the individual granules of tightly packed snow firmly together, creating a hard surface that will withstand passing traffic much better.

The length of time needed for a trail to set up correctly can vary from two to six or even more than ten hours, depending upon the temperature and moisture up. content of the snow. Trail set up can be similar to freezing a tray of ice cubes – after a short time there may be a crust but the cube isn't entirely solid and it generally takes a few hours for it to become fully firm. A snowmobile trail is no different. Therefore, it is vital that the trail remain as undisturbed as possible during this set up period for firmer, better quality trails that will stand up longer to snowmobiling traffic.

Ideally a snowmobile trail would be closed during set up time, but that isn't practical. Consequently, the best time to groom is generally at night when traffic levels are typically lower and air temperatures are generally colder.

For the best set up, it is strongly recommended that grooming occur at night after snowmobile traffic subsides. This also provides for the safer operation of both groomers and snowmobiles since it is easier to see oncoming lights and beacons. Most importantly, night grooming provides for more effective grooming since there is typically more time for the trail pavement to freeze solid before traffic resumes, maximizing the effectiveness of the area's grooming dollars.

It is recommended that daytime grooming be done in areas only if there is little or no daytime snowmobile use on the trail being grooming. Other exceptions would include special circumstances such as when daylight would aid operator visibility for initial early season trail set up and establishment or for trail reestablishment of the trail after big storms, extremely heavy snowfalls, and/or significant wind events.

Source: segments from www.snowgroominglinks.com/Groominglinkslinks.htm (Guidelines for Snowmobile Trail Groomer Operator Training available from www.snowmobilers.org and the International Association of Snowmobile Administrators)