

Experts on the Field, Partners in the Game.
www.stma.org

Snow Removal on Natural and Synthetic Athletic Surfaces

Revised document prepared by Ryan McGillivray, CSFM; Reviewed by Dennis Brolin and 2015 STMA Information Outreach Committee

Sports Turf Managers Association (STMA) is the not-for-profit, professional association for the men and women who manage sports fields worldwide. Since 1981, the association and its local chapters have been providing education, information, and sharing practical knowledge in the art and science of sports field management. Its more than 2,600 members oversee sports fields and facilities at schools, colleges and universities, parks and recreational facilities, and professional sports stadiums. The mission of STMA is to be the recognized leader in strengthening the sports turf industry and enhancing members' competence and acknowledgement of their professionalism. For more information, log on to www.STMA.org.

Snow can often be an issue on fields that are used late into the playing season. Early season snow storms are also a consideration in northern climates. As a sports turf manager, it is your job to ensure the field is clear of snow and ready for play. When planning snow removal, consider the following variables:

- How much snow is predicted?
- How much snow has accumulated?
- What type of snow is it - wet and heavy or light and powdery?
- Is there ice on the field?
- How soon does the turfgrass surface need to be used?
- What does the client want?
- What do field users need?
- What are space limitations of the field area – are there open areas to push the snow or is it a small, confined area such that the snow must be removed from the site?
- If snow is removed from the site, are there any restrictions on where the snow can be placed? Is there significant area available to place the removed snow?
- What time of year is it in relation to the underlying soil – is the ground frozen to support snow removal equipment?

- Will daytime high temperatures allow for any melting?
- Will nighttime temperatures refreeze what remains on the field?
- Will snow removal be handled in-house or will a contractor/service be hired?

Knowing the answers to these questions can help put a plan in place to prevent field damage and ensure snow removal is an efficient process.



Photo courtesy of Brad Fresenburg, Ph.D.

Snow Removal on Natural and Synthetic Athletic Surfaces

General Snow Removal Considerations

Athletic field snow removal is site dependent. Costs of snow clearing and removal will vary due to the needs for field use and the size of the field. Some facilities may require snow removal after every snow event while others may only require removal after the end of the winter season. Establish a concrete athletic field snow removal plan and budget prior to entering the winter months.

Where will you put the snow that has been removed?

If you are clearing snow throughout the season, removing snow will be much easier. After each snow storm, sunlight and potential for warmer temperatures will increase snow melting prior to the next snow event. If you are removing snow less regularly or at the end of the winter season, have a plan in place to where the snow will be placed.

A simple field calculation can determine an estimated untouched snow amount on the field. Multiply field square footage (length X width) by the depth (in feet) of the snow, divided by twenty seven feet cubed (27ft³). This will give you a rough estimation in cubic yards of how much snow is on the field surface. Given that there are different types of snow, packed snow will be closer to the estimated total while light, fluffy snow will be less than the estimated total because there is more air space between the snow particles. In theory, this estimation accounts for heavy snow. Once the snow surface layer is broken, the snow will compact during plowing, reducing the total estimated amount.

For example: An athletic field snow removal contractor is responsible for the snow plowing and removal of an 80,000 square foot synthetic turf lacrosse field in Boston, Massachusetts. Following a blizzard, the snow removal contractor measures a snow depth of 2.5 feet resulting in an estimated 7400 yards of untouched light, fluffy snow on the field (including air space). After the snow is plowed into piles and hauled away, total snow count removed is roughly 2500 yards. Given that calculation, nearly 1 foot of the total measured snow depth on the field was air space.

Determine how much of the field needs to be cleared.

Does the field need to be cleared to the walls or fences surrounding the field or can snow be left on the sidelines?

Removing snow over the fences can not only be more time consuming, but more costly. Hauling snow away from the site will require more equipment and trucks, as well as a location that will accept snow. This becomes especially important if snow is being removed from a synthetic infill field, as the snow will be embedded with crumb rubber. Stacking snow on the field surface may limit field space but will reduce time when clearing snow, resulting in lower costs. Consider stacking snow on both sides of the fence. Piling snow on only one side will increase the chances of the fence buckling or “blowing out” with the weight of the snow pressing up against the poles or mesh wire. Backing both sides with equal amounts of snow will lessen the opportunity for the fence to be damaged. Be cautious that piling snow on sidelines may create problems as additional snow events occur. Hauling snow offsite may be necessary if you experience several snow events.



Photo courtesy of Ryan McGillivray, CSFM

Determine when the field needs to be cleared.

Removing the snow during or after each snowfall is ideal to reduce the amount of snow to be cleared. If the field needs to be cleared by a specific date or even a specific time, assure that the field manager is aware of the time limitation. Snow totals and snow conditions will alter the amount of time needed for the snow removal operation. Allot enough time prior to field use for the entire field to be cleared and groomed or lined as needed. Fields that are cleared throughout the winter are often being used for daily practices or athletic events. Communication between the athletic team management as well as the field manager is essential to ensuring the field is cleared and ready for play prior to field use.

Snow Removal on Natural and Synthetic Athletic Surfaces

Determine who will clear the field(s) of snow.

Should the field be cleared by a private athletic field snow removal contractor or be completed by facility employees? Time and labor may provide an obstacle for many turf managers when it comes to snow removal. If the field is cleared by a snow removal contractor, ensure the contractor is licensed, insured, and experienced in athletic field snow removal. Contractors experienced in athletic field snow removal are more likely to clear athletic fields in an efficient method and are aware of the precautions needed in clearing and preparing the surface for play following a snow event. If the facility chooses to elect in-house employees to remove the snow, devise a plan that will increase efficiency while still taking precautionary measures to ensure the field is safe for use. With heavy snow events, contractors can be hired in to work along with the in-house crew. Enlisting volunteers to help remove snow may be another option. For example, in 2010, the Maryland Baseball Team helped remove 4 feet of snow from Bob "Turtle" Smith Stadium and Shipley Field so they could continue practices outdoors.

Determine Snowfall Expected.

When expecting a snowstorm, follow the forecast as often as possible. Forecasts can change by the minute, so staying on top of your local weather is important when planning for the next storm. If the snowfall totals are expected to be high, communicate with the athletic management team and field manager or snow removal contractor on the times the field needs to be readied for the event. Consider utilizing private weather services that allow managers to receive up-to-date, accurate forecasts for their location.



Photo courtesy of Ryan McGillivray, CSFM

Natural Grass Fields

Time of year and temperatures have a significant effect on turfgrass plants and soil environment. In the fall, the ground may not yet be frozen solid. Removing snow accumulations from unfrozen ground can cause substantial damage to an athletic field. However, unfrozen ground may aid in melting lighter snow events if soil temperatures are above freezing. If the turfgrass plants have had the opportunity to harden off, soils have frozen, and temperatures have gradually dropped, there is less chance for field damage from snow removal.

If a field is not being used throughout the winter months, a dense blanket of snow is the ideal scenario to ensure turfgrass survival by protecting the crowns from frigid temperatures. If the area is not affected by ice, allow nature to take its course with respect to snow cover. To assist with snow melt, clearing a path or channel along the perimeter of the field allows water from melting snow to flow off the field surface. If fields have been under snow cover for an extended period, turfgrass managers may notice snow mold development once snow melts. Depending on field history and if the field must be in game-ready condition in early spring, turfgrass areas will benefit from preventative fungicide applications prior to snow events, especially where cool-season grasses are being grown. In conditions favorable for snow mold development, unprotected turfgrasses can suffer from severe damage compared to turfgrasses protected with effective fungicides. Consult your local extension office or area sports turf consultants regarding fungicides suitable for your location and this disease.

Many have often worried about turfgrasses that are sealed beneath a layer of ice. Snow cover over ice-affected turfgrass was always thought to increase the potential for ice suffocation. Anaerobic conditions would develop and the lack of oxygen would kill turfgrass plants. Dr. James Beard found that this impact may not be as significant as often thought. He found the survival of both creeping bentgrass and Kentucky bluegrass to not be significantly impacted even after being covered for 150 days. To say it cannot happen would be incorrect, but the potential for plant suffocation under ice is very minimal. More extensive damage is likely if ice impacts the surface before turfgrass plants have a chance to harden and the temperature plummets. Freeze damage, especially to warm season grasses, may have a bigger role in winter injury. The following strategies are effective when dealing with ice on fields:

Snow Removal on Natural and Synthetic Athletic Surfaces

- If icing events are common in your area, allow turfgrasses to grow a little taller in the fall. Leaf blades protruding through a layer of ice will maintain good air exchange if you still have any concerns about suffocation.
- If at all possible, allow ice to melt naturally. Removal may damage turfgrasses more than just allowing it to melt.
- Applying a darkening agent to the ice surface can assist and accelerate ice melting. Darkening agents can include colored sand, compost, humates, or dark-colored organic fertilizer products. Black turf paint or green turf dyes can also be used. Inert products are the most desirable. Avoid the use of synthetic fertilizers that are high in nitrogen and/or phosphorus as they can impair water quality as the water from melting ice/snow moves into storm drains.
- Ice chunks can be broken up with shovels or scrapers and removed by hand. Smaller pieces can remain and be allowed to melt.

If the field is in use for athletic events, snow operations can begin prior to and after snow arrival so the field is ready for play. The following methods can be implemented to efficiently remove snow accumulations:

- If possible, tarp the field when snow is forecasted. Snow removal will be easier with a tarp and there is reduced chance of turfgrass damage from clearing operations. Removing snow from a tarp will cause damage to tarps, so be prepared to replace the tarp.



Photo courtesy of Jason Kopp, SCPS

- Remove snow early in the morning or on cloudy days when the snow is cold and firm. Snow may be lighter and can be blown away more easily with the use of tow behind and mounted turbine blowers or backpack blowers. Mechanical injury is also less likely to occur to the field. Once the snow layer is broken, sunlight will increase melting, resulting in less snow to be removed. Be aware, exposing the grass surface may increase thawing in the ground, releasing moisture, resulting in a wet surface prone to rutting or scalping.
- For higher accumulations, snow can be mechanically removed using walk behind snow blowers, a skid-steer, or tractor mounted removal methods such as a plow or snow blower. Utilize low-ground pressure (LGP) equipment to minimize impact on the playing surface. Tractors or grounds equipment should be equipped with flotation turf tires or wide tracks that disperse weight uniformly over the surface. Heavy equipment (used on roadways) is more likely to rut and damage the playing surface and underlying sub-base. Utilizing pickup trucks with snow plows is more likely to cause damage to the field due to weight distribution and how the truck reacts to pushing heavy snow. Four-wheel drive on-road vehicles such as dump or pickup trucks are more likely to tear or rut turfgrass (especially when turning) because the front tires are working against each other to spin and gain traction.

Snow Removal on Natural and Synthetic Athletic Surfaces



Photo courtesy of Ryan McGillivray, CSFM



Photo courtesy of Jason Kopp, SCPS

- Do not mechanically remove snow down to grass level. Allow a 1/2 inch of snow to remain on the surface. The last 1/2 inch protects against damage to the turfgrass surface and/or tarp. The remaining layer can be melted

by the sun, removed using hand shovels, or melted with a darkening agent.

- Keep passes over the field to a minimum. Repetitive clearing of a field is more likely to damage turfgrasses due to wear and direct contact with the surface. If time and labor allow, try not to allow more than 4 inches to accumulate on the surface at a time when heavy accumulations are forecasted.
- When removing snow deeper than 1 foot, section the field off into thirds or quadrants. Do not try to remove more snow than the removal equipment can handle, as this can lead to spinning tires or tracks on the playing field. For snow blowing, start on the perimeter of the field and throw to the outside edges. Begin working to the inner parts of the field so that you are throwing the snow in places you have already cleared. Though this seems repetitive, the snow removal equipment will not be bogged down by too much snow being consumed at once. In small, confined areas, snow may be loaded into a utility truck and hauled away.



Photo courtesy of Ryan McGillivray, CSFM

- Darkening agents can be used here as well to assist with snow or ice melting. Darkening agents can include all of the products mentioned previously.
- Try to prevent melted snow from refreezing during nighttime hours. Remove slush and puddles with shovels or squeegees.

Snow Removal on Natural and Synthetic Athletic Surfaces



Photo courtesy of Brad Fresenburg, Ph.D.

Damage Commonly Caused to Natural Grass from Snow Removal Operations

Scalped Turfgrass

Even if the ground is frozen solid, turfgrass can easily be scalped similar to how a mower would cut too deep if the surface is not consistent or sloped properly. Undulations on the surface from goal mouths, settling, or divots can cause the plow or snow blower to “nose dive” and cut through the turfgrass layer into the rootzone mix. Snow plows and blowers have fixed cutting edges that ride across the surface at a given height. If the snow removal operator is not aware of the buried dips in the surface, the cutting edge can tear the turfgrass and expose bare soil.

Rutting

The window for opportunity to remove snow from a natural surface relies on the amount of time the ground is frozen and the type of equipment used to remove the snow. The probability of rutting occurring on an athletic field increases when the ground begins to thaw. In general, natural grass snow removal must happen during the morning hours when cooler temperatures from overnight have frozen the ground. As a result, natural grass snow removal may occur over the course of several days.

Rutting can also occur when snow removal equipment used on the playing field is too heavy or not equipped with low ground pressure tires or tracks. Equipment used for roadways or paved surfaces should not be used for removing

snow from athletic fields unless its intended purpose is for maintenance or construction of athletic playing surfaces.

Winterkill

If snow is removed too early in the season, turfgrass plants are more likely to be exposed to consistent freezing temperatures. Snow blankets the turf over the winter months, protecting it from harsh winds and sub freezing temperatures. Early or extended exposure to these conditions may result in winterkill damage to the turfgrass plants.

Synthetic Turf Fields

Be sure to check with the synthetic turf manufacturer before plowing snow from the field. Plowing can wear fibers on the surface and may void the warranty of the field. If snow is in the forecast, tarp the field if possible. Snow removal will be easier with a tarp and there is less chance of damage to the synthetic surface.

The practices utilized to remove snow from natural grass fields can be applied to synthetic fields (see above) with one exception. The application of darkening agents to melt snow or ice should be avoided. These materials will contaminate the infill material and possibly create issues that may void the warranty. A few other issues exclusive to synthetic surfaces should also be taken into consideration:

- Low-pressure ground equipment is critical with synthetic surfaces in that rutting of the under-lying sub-base can occur. Once these ruts are created, they are very difficult to remove.
- Newer, light weight snow plows are available with rounded edges to prevent gouging of the carpet as this could lead to a very significant and costly repair. Always leave a ½ inch of snow on the surface to prevent the displacement of infill material.

Snow Removal on Natural and Synthetic Athletic Surfaces



Sports Field Manager Jason DePaepa fabricated a specialty blade for a tractor-mounted plow to prevent the plow's steel edge from digging into the playing surface.

- By leaving a 1/2 inch of snow on the surface, managers do not need to be concerned with plowing against the seams. To further prevent damaging the seams, never plow at more than 10 mph and take your time so the plow does not bounce.
- Ice crystals attach to crumb rubber particles and synthetic fibers, which results in the appearance of a snow covered surface. Allow sunlight to melt remaining snow and ice to eliminate the need to scrape the surface clean.
- The only darkening agent that would be approved to accelerate melting of remaining ice or snow would be crumb rubber. Black crumb rubber is the preferred method because it reincorporates into the synthetic system. Allowing the field to sit in the sun for 20-30 minutes after clearing operations can also melt the last of the snow. Running a field groomer over the last bit of snow can also assist in dissolving it.
- Ice presents an issue for synthetic fields because water can freeze both in and on the field. When melting snow, there is always the possibility it may refreeze as ice. If time and money allow, a tarp can be used to cover the field and heaters can be used to blow hot air under the tarps and dry the field out. This method was utilized at University of Minnesota. Four heaters supplying 2

million BTUs each heated the fields beneath tarps. The heaters melted the ice and dried the remaining snow to leave the field softer and ready for use. The heated tarps also kept additional snow from accumulating prior to game time.



Photo courtesy of Ryan McGillivray, CSFM

Damage Common to Synthetic Turf from Snow Removal Operations

Torn Seams

Seams are more likely to tear when plowed against the direction of how the turf was laid. If snow must be plowed against seams due to location of snow removal, be aware of the potential for tearing. Inlaid lines are glued into place, not sewn into the carpet. Fields with more inlaid lines (multiple fields laid out on one surface) require more cuts, resulting in an increased potential for torn synthetic turf or lines being pulled from glued locations.

Crumb Rubber Displacement

When removing snow from a synthetic turf crumb rubber infill field, you are more likely to see crumb rubber displacement off the field in piles of snow. Be aware of the environmental concerns of where you will remove or stack snow. Placing snow near woods or wetlands can draw a larger concern for contamination to ground water or surrounding areas. If snow is placed on the field, small piles of crumb rubber will appear where snow piles melt. By using a shovel or small topdresser, lightly spread excess crumb rubber on the field (possibly in areas with higher traffic: goal mouths, center field, or sidelines).

Snow Removal on Natural and Synthetic Athletic Surfaces

Rutting

When removing snow from an athletic field with heavy equipment not designated for athletic field snow removal, rutting of the under-lying sub-base may occur due to heavier weight distribution across the surface of the field. Rutting can also occur if the field was constructed using unstable material, causing displacement of the sub-base, resulting in impressions left by tires or tracks.

Wear on Synthetic Fibers

As a field is plowed more often, synthetic turf fibers can lose their vigor. Similar to how turfgrass plants are worn due to increased foot traffic, synthetic turf fibers can become fractured and worn, resulting in folding over of the fibers.

Facility Damage

Not only can damage occur to the athletic surface with snow removal operations, damage to the sports facility can also occur.

Broken Fences

Fence damage can be avoided if snow is piled away from the fence, or if needed, on both sides of the fence. Piling snow on only one side will increase the chances of the fence buckling or “blowing out” with the weight of the snow pressing up against the poles or mesh wire. Snow piled on one side of the fence will melt and refreeze causing the mesh wire to warp in the shape of the snow pile. Backing both sides with an equal amount of snow will lessen the opportunity for the fence to be damaged.



Photo courtesy of Ryan McGillivray, CSFM

Cracked/Bent Soccer/Lacrosse Goals

An easy solution to reduce the chances of temporary items on the field, such as benches and goals, from being damaged is removing them and storing them off the field after a practice or event or following a season ending. Weight from the snow can pull nets, causing goal braces and crossbars to break or bend. Removing nets from the goal frame after a season is over can reduce the chance of damage by weight of the snow.

Bent Benches/Bleachers

Benches or small bleachers are easily hidden under large snowfall and are easily broken by snow removal equipment. If you cannot remove these items from the field, place stakes, caution tape, or markers around the items so the person responsible for removing the snow is aware of the location of hidden items.

Torn/Ripped Wall Padding

Torn wall padding is caused by snow removal equipment coming in too close of contact with the wall itself. Stay at least 1-2 feet away from walls and use a shovel or small snowblower to remove remaining snow.

As a sports turf manager it is important to always be prepared. Have a snow removal plan in place before bad weather hits. Pay attention to weather forecasts and prepare your crew and your field for snow events. Having a plan in place will help you maintain professionalism and communicate needs and expectations to users, coaches, media, and the public.

References:

Contributions by STMA Information Outreach Committee
Photos provided by Brad Fresenburg, Ph.D.
David Minner, Ph.D. – Let it Snow – SportsTurf February 2011
Steve LeGros – Snow Removal from Synthetic In-filled Systems - <http://plantscience.psu.edu/research/centers/ssrc/research/snow-removal>