The Legend of Daryl Asher vs Anoxia (He Rides a Dark Horse)

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Winter injury is a common enemy to many in the turf business. Daryl Asher*, Superintendent of Edmonton's Glendale Golf & Country Club, was experiencing his fair share of casualties on the battlefield, um, I mean, golf course.

Edmonton winters are less predictable than they used to be and they're seeing more freezing and thawing in November and early December. These conditions result in ice formation on greens in poor draining areas that ultimately leads to poor spring turf conditions. With ever-changing weather patterns, areas that do not usually experience these conditions are now seeing more of this type of weather and managers find themselves struggling to deal with the damage.

Three years ago, Daryl decided to do something about all that. He installed a tarp cover system over the greens. These systems have been used in the U.S. for the past 10 years with good success. Wouldn't you know it – that winter provided the perfect conditions for another problem to occur. And that's when Daryl met the dastardly foe anoxia face to face! He pulled up those tarps in the spring and instead of less damage, he found more. "The turf was rotten," Asher states simply. He suspects several reasons. "It was a very wet fall; the tarps went down before the ground froze enough to bring the turf into dormancy; and heavy snows then covered the tarps and created even more insulation which prevented the necessary freezing temperatures." This allowed microbial activity to produce the anaerobic conditions that results in suffocation (what anoxia's famous for). Put another way – the microbes had a huge under-cover party and trashed the place! We all know that aerobic activity increases our intake of oxygen (O_2), and that's good for us. But all that activity creates waste by-products – among them, carbon dioxide (CO_2) – and if we don't get rid of it, that's bad for us. Anoxia damage in turf seems to be linked to this very type of gas activity.

Figure 1. Laying out the tarps in fall.

Figure 2. Turf damage in spring. *"The turf was rotten."*

There's not a lot of information available regarding how to create under-cover conditions that provide healthy turf hibernation in spite of what might be happening with the weather. The one thing Daryl knew for sure was that he needed to create an environment that would lower the CO_2 levels under those tarps. Venting seemed the answer, but while others had tried perforated pipes, it seemed that pipes by themselves did not allow for enough movement of CO_2-out and O_2-in. What to do? Reach for the leaf-blower, of course! He regularly uses the blower to exchange the air under the tarps. He's having good success, too – last spring there was comparatively little damage to the turf. "We removed the tarps and saw a 98% success rate based on the square footage of the turf we had covered."

Figure 3. Laying out vent tubes.

Figure 4. Tarps placed over vent tubes.

The next thing to do is determine acceptable under-cover O_2/CO_2 levels and create a venting schedule to produce the best results with the least labour output. That's where Jim Ross, Prairie Turfgrass Research Centre, enters the story. Jim loves nothing more than to measure all things turf and, in a study conducted at PTRC, he's taking gas readings under tarps to establish guidelines for acceptable gas levels. Jim will be writing an article for publication in the next newsletter detailing some of what he's learning in this study, so stay tuned.

Figure 5. Set up for metering gases.

Figure 6. System ready for blower & meter.

Daryl put the system together and fine-tuned as he went along. "We use the Greenjacket** tarp and vent system that includes a non-permeable woven plastic cover and a foam insulation material that is installed under the plastic cover. To cover our greens, tarp sizes range from 9,000 - 14,000 sq. ft. The vents are made of a high-density poly product that is collapsible and has ½-inch holes evenly spaced to allow air (forced and passive) to get out and move under the tarp. The vent tubes are installed under the foam insulation. This season we installed ¼-inch poly gas tubing that will allow us to monitor CO_2 and O_2 under the tarps and track the ratios between the two during the time the turf is covered. The gas sensors are located in the middle of the tarp. We also installed temperature sensors in three locations – front, middle and back. We take readings once or twice a week, depending on conditions."

PTRC research indicates that microbial activity may cease at anything under -2^{o}C. They'll continue to take "temperature versus gas" readings on a regular schedule until they determine exactly how outside conditions, as well as how active venting, are affecting the numbers under the tarps.

Figure 7. Meter for gas determination.

Daryl is pleased with the results to date and expects to continue to learn more as time goes on. Considering the lost revenue in the spring and cost of re-establishing the greens damaged by winter injury and anoxia, the investment he made was worthwhile. The entire system cost ~$75k and he estimates annual maintenance costs of ~$4k. He extends one 9-month seasonal employee to a full-time position to install the tarps, carry out the winter venting and maintain the system. He sees this as a win-win, because that keeps another qualified person on board at the course and reduces training costs in the spring.

All this is not to say that this approach doesn't have drawbacks. Zero damage is not guaranteed. This is a relatively new approach to preventing injury and there's always other problems that might occur that can't be predicted. Asher also comments, "Another of the almost forgotten side effects of tarping and having some success is that members' expectations have risen sharply. They now expect almost perfect conditions on opening day regardless of the previous winter conditions and weather patterns."

Daryl had to hunt for information to establish a battle strategy against anoxia, and it took commitment to put the system together and iron out the bugs. However, as Daryl says, "Failure is a great motivator. Having seen what can happen given the right set of circumstances convinced us that we had to find a better way to give ourselves a chance at reducing the potential for that type of damage." Many thanks to Daryl Asher for generously sharing what he's learned with others in the same situation – he's one knight who is helping to put another chink in anoxia's armour!

* In addition to being Glendale's Superintendent, Daryl Asher is also a Director of the Alberta Turfgrass Research Foundation which operates the Prairie Turfgrass Research Foundation

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