

applications are not made. A decrease in moss control was observed with single applications of Quicksilver when applied to *Amblystegium serpens* and *Bryum argenteum*. The decrease in moss control was attributed to moss regrowth. Quicksilver applied at the highest rate with a sequential application controlled *Bryum argenteum* 39 percent 28 days after initial treatment. This was the greatest visual control observed with any moss species.

All Quicksilver treatments reduced cover of *Entodon seductrix*, however control never exceeded >15 percent. Both Quicksilver and Junction provided minimal visual control of both *Amblystegium serpens* and *Entodon seductrix*.

Digital Analysis Data Digital analysis data and visual control ratings had similar trends with chemical control of all three moss species. The digital analysis confirmed the visual control ratings. Therefore, the digital analysis data are not presented.

CONCLUSIONS

When reviewing the data presented in this article, please keep in mind

MOSS CONTROL PROGRAM

Below is a moss control program that Scott McElroy, Ph.D., has developed through research and observations of successful moss control programs on golf courses that he suggests to superintendents.

- Two applications of Quicksilver at 6.7 fl. oz. per acre applied two weeks apart.
- Topdress, topdress, topdress. A light, frequent topdressing program will help reduce moss populations.
- Aeration will help.
- Apply sufficient nitrogen to maintain reasonable growth of creeping bentgrass.
- Quicksilver applied after a bensulide application can induce injury in creeping bentgrass.
- Junction is best used preventively rather than as a curative for moss.



Silvery thread moss growing on a putting green

growing conditions were favorable for moss and there was no competition present from creeping bentgrass. Also, no cultural practices were implemented that would hinder growth of the moss or favor competitiveness and growth of creeping bentgrass.

In short, conditions were nearly ideal for moss growth and regrowth. On a golf course, more than two applications of Quicksilver or Junction, together with cultural practices, would most likely provide greater moss control than reported in this article.

Quicksilver provided greater control with all three moss species than Junction. Control of all three moss species with Junction was minimal — less than 15 percent. Sequential applications of Quicksilver are required to reduce moss regrowth. Single applications of Quicksilver can increase growth rates of *Bryum argenteum*.

Quicksilver applications made to the other moss species stabilized growth rates but did not decrease populations. Erratic Quicksilver efficacy could potentially be attributed to diversity in moss species. Variation in moss control on putting greens among golf courses could potentially be attributed to differences in moss species.

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References

- Anonymous. 2006. Junction fungicide/bactericide product label. SePRO Corporation. Meridian, IN.
- Anonymous. 2005. Quicksilver herbicide product label. FMC Corporation. FMC Corporation Agricultural Product Group, Philadelphia, PA.
- Boesch B.P. and N.A. Mitkowski. 2005. Chemical methods of moss control on golf course putting greens. *Applied Turf Science*. October: 1-8.
- Burnell K.D., F.H. Yelverton, J.C. Neal, T.W. Gannon, and J.S. McElroy. 2004. Control of silvery-thread moss (*Bryum argenteum* Hedw.) in creeping bentgrass (*Agrostis palustris* huds.) putting greens. *Weed Tech.*:18:560-565.
- Cook, T., B. McDonald, and K. Merrifield. 2002. Controlling moss in putting greens. *Golf Course Manag.* Sept. 70(9):103-106.
- Happ, K.A. 1998. Moss eradication in putting green turf. *USGA Green Section Record*. 36(5):1-5.
- Hummel, N. W., Jr. 1994. Methods for moss control. *Golf Course Manage.* 64:106-110.
- Landschoot, P., J. Cook, and B. Park 2004. Moss control- new products and strategies. *USGA Green Section Record*. 42(4):7-9.
- Nelson, M. 2007. Of moss and men. Available at http://www.usga.org/turf/green_section_record/2007/jul_aug/ofmoss.html. Accessed on September 15, 2007.
- Senseman, S.A. 2007. *Herbicide Handbook*. Weed Science Society of America ninth edition. pp.197.
- Settle, D.M., R.T. Kane and G.C. Miller. 2006. Evaluation of newer products for selective control of moss on creeping bentgrass greens. *USGA Turf and Environ. Research Online* 6(5):1-6.
- Turgeon A.J. and J.M. Vargas Jr. 2006. *The Turf Problem Solver*. New Jersey: John Wiley and Sons. pp. 162-163.
- Yelverton, F.H. 2005. Managing silvery thread moss in creeping bentgrass greens. *Golf Course Manag.* Mar: 103-107.



“The edge of failure is determined by how the green was constructed, the cultivar, the budget, the equipment, and most importantly, your talent.”

KARL DANNEBERGER, PH.D., *Science Editor*

The edge of failure

Several years ago, Dr. Joseph DiPaola and I led a seminar about turfgrass stress. Dr. DiPaola started the seminar off by sharing our philosophy of turfgrass management, which basically stated that we manage to the “edge of failure.” Given a starting point of healthy turfgrass, we begin to move our turf — in this case a putting green — toward a more functional surface.

The benchmark we used for putting green functionality was green speed. From a management perspective, as we push our healthy turf to be more functional we move along the continuum of healthy turf toward the “edge of failure.” It’s analogous to the “fiscal cliff.” Considerable anxiety existed about whether we would go over the cliff, wreaking havoc on our economy.

On putting greens, we face the same anxiety as we push toward the edge of failure. Visually, for me, the edge of failure was similar to the cliff on a plateau. If we push our putting green over the cliff, it crashes to the bottom of the basin. There goes our healthy turf.

Unlike the fiscal cliff, where we knew exactly when and what conditions would trigger the fall, knowing when a putting green is approaching the edge of failure is not clearly defined. The edge of failure is determined by numerous factors, including how the green was constructed, the cultivar or variety used, the maintenance

budget, the equipment used and how it is maintained, and most importantly, your talents as a superintendent in achieving the goals you’ve set.

As we move toward the edge of failure, what makes us back away from the edge? Unfavorable environmental conditions such as temperature, moisture, light or water quality can make us slow down or back off. In practical terms this may mean switching from grooved roller to solid, raising the height of cut, or reducing the frequency of mowing, just to name a few.

Given stressful environmental conditions, it’s still difficult to know precisely how much we can move forward toward the edge and how far we should move back. That’s because biological systems are complex and unpredictable.

To show just how unpredictable they are, I use the example of a sparrow. I can take a dead sparrow, throw it up in the air and calculate its flight pattern. But if I take a live sparrow and throw

it up in the air, I have no clue what its flight pattern will be. Non-living objects are fairly easy to predict. Living organisms, not so much.

We, however, live in a world of metrics. Government, business and yes, universities, run on metrics. Often metrics quantify information but don’t speak as clearly to quality. In golf, the Stimpmeter quantifies green speed and provides us with a number, regardless of conditions. Thus, we have a quantified Stimpmeter number such as 11 then argue for or against what that number means based on qualitative biological factors such as cultivar, green construction and more.

Given that putting green management is highly variable relative to the Stimpmeter, what do I go off and do? I asked the Greater Cincinnati Golf Course Superintendents Association “At what green speed do you see turf injury?”

The survey was done anonymously during the summer stress period through a middle person, so I did not know the courses or the superintendents. The survey was not scientific and serves only as a point of discussion, but I found that at Stimpmeter readings of 9 feet 6 inches there was 20 percent turf injury; 10 feet 6 inches there was 60 percent turf injury; 11 feet there was 90 percent turf injury; and 12 feet there was 100 percent turf injury.

What’s interesting about this small amount of data is how it provides a probability of success or failure given a certain green speed. As we get questioned about how fast or firm we can go with our putting greens, given all the variables that need to be accounted for I am afraid that we’re going to have to define the edge of failure based on probabilities — whether I like it or not.

Karl Danneberger, Ph.D., *Golfdom’s* science editor and a professor at The Ohio State University, can be reached at danneberger.1@osu.edu.

The art of brushing

Chip Howard, Ph.D., (turfsci@cox.net) owns the consulting business TurfScience, Inc., and manages several golf courses in the Southwest.

Q Brushing means something a little different to everyone. Describe brushing as you use it on the golf course.

The brushing equipment that I manufacture is not a “one brush accomplishes all.” The brushes are designed to provide appropriate and fruitful brushing options for every day of the year that greens are mowed. It is then the art of the superintendent to determine what degree of aggressiveness they desire to achieve the best results at any given time.

For example, on creeping bentgrass in the North, an extremely mild brush would be appropriate for the first mowings in spring or during mid-summer stress. However, an extremely aggressive brush would be appropriate for the May and September growth surges. In contrast, on bermudagrass, we use a mild brush in the winter, a medium brush through transition and switch to a very aggressive brush in mid-summer to counter the thatch accumulation.

Q What are the major improvements to putting quality and putting green health you have seen by routine brushing?

Whether creeping bentgrass or bermudagrass, the concept is the same,

although the things happen at different months of the year. What I have seen over the last 20 years of brushing is identical to virtually all the feedback I have received from superintendents. If brushing is begun during the growth seasons, after two weeks, the coarse-texture horizontal leaf blades will be gone and the remaining tissue will have a finer texture and be oriented vertically. After week three, the plants will have responded by making new plants in-between the existing plants. The result is increased density and finer texture. This greatly enhances the physics of ball roll.

Q If greens are brushed daily, do you think mowing heights can be raised slightly without sacrificing green speed?

So many superintendents have reported this to me that it must be real. I certainly agree with whatever works for the individual who is responsible for the product. But I take a different approach. Once your leaf tissue is oriented vertically, it can tolerate unbelievably low mowing heights with no detectable ill effect. So, a consequence of brushing will be that a superintendent will have greater latitude for green speed. If they desire an extra foot of speed for a tournament, just lower the height 0.010 – 0.015 inches.

“The extremely aggressive brushes are reported to be more effective than groomers but without the negative consequences.”

CHIP HOWARD, PH.D.

Q What are the advantages of brushing over grooming or light verticutting?

As a superintendent, I gave up on grooming long ago, for many reasons. In order to get out of corners that I shouldn't have gotten into, I found myself verticutting greens but holding my nose while doing so. The mechanical action of verticutting is damaging to the crown of the plants, and the after-effects seem to last a long time.

The extremely aggressive brushes are reported to be more effective at grooming than groomers but without the negative consequences. Though brushes can't be as invasive as a piece of steel spinning at high speed as with verticutters, I am noticing that repeated use of aggressive brushes produces the same effect but without the negatives. That said, if your goal is to shred thatch for instant removal, verticutters get the job done that day.

Q What brushing strategy do you recommend for season-long use and why?

My goal was to design a system by which a superintendent could brush every day they mow. As I mentioned, that can be done by having a spectrum of brush aggressiveness options available that can be matched to the agronomic needs of the day. To fulfill that need, I currently have six brush options available. I am also playing with some other brush devices that are clearly outside the box of current thinking, some of which may take us in new directions.



Clark Throssell, Ph.D., loves to talk turf. Contact him at clarkthrossell@bresnan.net.

The 19th Hole with...

Scott Ramsay

CGCS // Yale Golf Club, New Haven, Conn.

What's your drink of choice after a round at a new course? I usually ask if there is a house cocktail. Lots of clubs have signature sandwiches and drinks. But my standard is a tall Absolut and tonic, plenty of ice.

You're at Yale Golf Club. Is it safe to say that some of the smartest college kids on any golf course crew can be found working for you?

I'm continually amazed with the Yale students. Each year I hire a dozen students for the summer, but I usually only have four to six at any one time since they're so busy with other opportunities. One month they're hover-mowing bunker banks, the next they could be in Washington D.C., on Wall Street or at an NHL training camp.

You're always taking great photos with your iPhone. Can you give us a tip? I use a macro lens made by Olloclip (www.olloclip.com), which slips onto my iPhone for close-ups of turf for disease diagnosis. It's a fish-eye lens, a wide-angle lens and a macro lens all in one body. Anytime we get a disease, they want a picture... it's hard to get a macro photo. The macro (lens) is what I use the most.

You guys have had some crazy weather lately. This past year we were on the very eastern edge of Hurricane Sandy. We lost 264 trees on the golf course and we are still



"IT SEEMS LIKE THE WEATHER PATTERNS ARE VERY INTENSE NOWADAYS. WHETHER IT IS CLIMATE CHANGE OR HOW THE NORTH ATLANTIC OSCILLATION IS SET UP, THE NORTHEAST IS GETTING WHACKED."

cleaning them up. Connecticut didn't get the news coverage that New York and New Jersey did, but golf here took a hit.

But spring is here! Ready for March madness? Go Yale! Currently ranked No. 13. Hope they make the regional in Providence, R.I., and ultimately the Frozen Four. You meant hockey, right?

Uh, no. Tell me about your family?

I married Meg, a superintendent's daughter, 26 years ago. Our son Bennett is at the University of South Carolina. Meg is a registered nurse and manages two Ambulatory Medical Centers.

Wait, you married a superintendent's daughter? My father-in-law (Roger Turcotte, Montaup CC, Portsmouth, R.I.) is a longtime superintendent, nearly 50 years at the same golf course. My wife and I were both in college — her roommate was my roommate's girlfriend. I had no idea I was going to be in the business. I didn't know of him until our fourth date. She pulled out a *Golf Course Management* magazine from my 1972 Volkswagen Beetle, and she goes, "Golf course management? That's what my father does!"

So she must have sympathy for the hours you keep, then? It's probably why I'm still married.

As interviewed by Seth Jones on February 19th, 2013.

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