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Two of the students who received Bayer scholarships were UW-Madison grads.



Dr. Jung and President Pinkerton at the Wisconsin hospitality room.

(a strength of Dave Fearis). Watschke replied appropriately for his environmental leadership award. And Nancy Lopez, the 2000 Old Tom Morris Award winner, couldn't have demonstrated what a perfect choice she was any better in person that she did from the satellite hookup. There wasn't a dry eye in the crowd; her father is gravely ill and she needed to be with him. Despite that stress, she showed the traits we all love in any person in her rather short acceptance. Credit

Three giants in golf course irrigation in Wisconsin - Gordy, Tom & Ken.



Mr. & Mrs. Ralph Christopherson of Wisconsin Turf Equipment Corp.

must be bestowed on GCSAA staff for organizing this alternative.

Henry March was good as a featured speaker - good message with clear lessons. It was a little overdone and hyper for my taste, but I still applaud him and his success.

5. *Research Session.* Not what I expected; in past conferences this was a chance for research scientists to present their work and summarize what was being done in labs around the country on various subjects important to us. The actual title under the research session was 'Science for the Golf Course.' Most were pertinent topics; one in particular was an insult it was so simple. And as usual, some have awful slides, a sin in this day of technology. Gail Schumann and Michael Farrar were the best.

6. *Greens/Between Roughs.* I moved back and forth between these two; nothing really new but nevertheless it was a productive afternoon.

7. *Innovative Superintendent I and II:* I enjoy these - breakfast at

6:00 a.m. and lecture at 7:00 a.m. Just like home! Not all were good; not all were relevant. But I respect colleagues who prepare to share their successes with their colleagues. The best of the bunch was Michael Lee's presentation about his phantom crew. The talk was great, he seemed well practiced, and his slides and power points took the day. In second place was Merrill Frank, a veteran of *Poa annua* management for 38 years.

8. *Green Section Program.* I missed this for the first time ever. It conflicted with the chapter editor's seminar. All reports gave it high marks.

9. *Equipment Show.* I have never left a conference with a better feeling about the equipment show than I did about this New Orleans effort. Troubling to me is that I cannot put my finger on the reasons why. Here are my suspicions; maybe some of you can help figure why:

a. The show floor was big. This allowed for wide aisles and plenty



**Dr. Steve Millet held court with both current and former UW-Madison turf students.**



**A couple of old GCSAA vets – Tom Harrison and Jerry Kershasky.**

of room to move.

b. The hall was rectangular, making it easy to find vendors in the first place and to return for more information. The space was well allocated.

c. The hours were generous.

d. It was easy to leave and find a place to sit. Plus, the member lounge was a good idea for weary showgoers.

Another point on the plus side was the fun of getting another Jacobsen hat for my collection. But on the negative end was the lack of tables and chairs at the food stands. I like to sit at lunch time.

10. *Bookstore.* For bibliomaniacs like me, this was a great stop. There were some outstanding bargains. And I had a truck to haul home some treasure for the university interns I'll have on our staff this summer. Although there were no formal book signings, a few authors were in the store and happy to autograph their books. I believe this is one of the best benefits of a GCSAA membership - good books at a fair price.

The soft goods selection was down from previous years, and the bargains were not anything special. We can all do better in our golf shops. But, on the other hand, the logo is offered nowhere else, so the complaint isn't exactly fair.

11. *Wisconsin Room.* What a night! Everybody was there; spirits were high. There seemed to be enough room to sit, if you wanted to.



**Mike and Majorie Kilpatrick enjoyed the Dinner Show as much as the rest of us.**

Friends and colleagues, UW faculty, Dean Carl O'Connor and his wife and daughter, USGA guys (including retired Jim Latham) and many, many more enjoyed the hospitality room for conversation, snacks and plain old socializing.

12. *The Dinner Show.* GCSAA has FINALLY got it right. The head table preening is over; Old Tom Morris Award is presented elsewhere; and, apparently once again, we are all welcome. Last year, 62 tables of 10 people each were reserved. We peons were relegated to the cheap seats regardless of how early we arrived and what arrangements had been made for a good seat. That was wrong and it must have been realized as wrong. And this year, the entertainment was great; from old rockers like me to kids like my assistant, the Four Tops



**Mike Lee spoke at conference and proved he is an innovative superintendent.**

had enormous appeal. The show during the head table seating on through the salad serving was fun, fun fun! Phil Tralies should feel really good about this party. Jacobsen got its money's worth and then some. It was enough to make you want to run out and purchase a LF! Thanks.

13. *Other Pluses.*

a. The weather was as good this year as it has been bad other years. Warm with no rain.

b. Shuttle service ran on time and ran frequently. The buses were clean, the drivers were polite, and the routes were idiot proof.

c. No severe hotel problems that I heard of.



The entertainment before dinner was colorful and exciting.



Mardi Gras costumes can be very elaborate.

d. More educational offerings than one person could attend. Serious courses should send two if they can afford it.

14. *Some minuses.* Not everything was perfect, leaving room for improvement for next year.

a. PLEASE. PLEASE. PLEASE. Find somebody to design a conference and show directory that has a little usefulness. Just a little. They almost always are poor; this year set the all-time worthlessness record. This was a bad directory. I am going to look up all advertisers in it and write a note to them asking them not to advertise in it next year until they see it and only if it



The Four Tops still have it - there wasn't a somber face in the hall! They were accompanied by a 14-piece orchestra.

has value to conference goers. The conference and show is a cash cow; GCSAA should take a teeny little bit of money from the member registration fees and give us a directory we can actually use. Size it right, keep it small (i.e. NO ADS), organize the information in a useful and accessible fashion. Make it understandable to an average adult like me. The one offered this year was worse than useless; it was an aggravation.

b. I'll say it again, as I do every year: preview speakers and their visuals and only invite them if they have an interesting message that is somewhat relevant and well presented.

c. Figure out a way so that access to seminars is equally available to all. Same with hotels. Those not on the Internet or who choose not to use that system are screwed. And they are angry.

d. Lose the GCSAA travel service. Or hire another one. I don't think GCSAA should be in the travel business. The all too frequent mistakes reflect badly on the association.

e. Have someone who works with the books at GCSAA headquarters try to neatly remove the price tag on the back of a book that might be intended as a gift. It will take ten minutes, a chisel and hammer, and more patience than normal people have. Go to Borders or to a Barnes

and Noble bookstore and see how their price tags come off without ruining the jacket. Then use them and throw away whatever you now have. They are terrible.

f. Why take a fun program (18-hole challenge) and change it into a pain in the neck (27-hole challenge)? Leave a good thing alone.

Notice, I have not said anything about PDI, the issue that could have made this a controversial and divisive conference. However, GCSAA has done such a lousy job of informing us about it and explaining its ramifications that most members were (and still are) clueless. The war over PDI (which is NOT member driven, by the way) will be fought in the next couple of years. I am glad it was not an issue; it could have spoiled what otherwise was a great conference.

I have liked all the GCSAA conferences I have attended, some more than others. One I liked the least was the last trip to Dallas. It was a city that made me feel unsafe, with inconvenient housing arrangements and a poor convention center. Let's hope that all has changed by next year. ♻

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# A Pathetic Winter

By **Monroe S. Miller**, Golf Course Superintendent, Blackhawk Country Club

Most of us northerners need a good, cold, snowy winter to feel right about things, you know - life. It is part of our culture and I think there is even a genetic need for some of us. But we didn't get it this past winter and I feel terribly uncomfortable about it. I also believe our golf courses do better if there is snow and cold.

I usually don't put much faith in a rodent's prediction for the arrival of spring, but it coincided again this winter with what we have come to expect in recent years in Wisconsin.

Groundhog Day dawned early and the presence of the sun made people like me smile. With sun comes sunshine and if there is sunshine, Sun Prairie's Jimmy the

Groundhog could be expected to see his shadow. If he sees his shadow we can expect (with 79% accuracy) six more weeks of winter.

But before Jimmy emerged, the sun slid behind the clouds. When he did make his appearance he did not see his shadow. Drat. I suspect I am not the only golf course superintendent in Wisconsin who could have used a couple of extra weeks in the shop. But it wasn't to be. Golf courses all over the state opened in late February and early March. There were record high temperatures on February 25th - mid-60s into the north. The Birkie was canceled in Hayward. The north country, in fact, may have been more shocked than those of us in the south. But

regardless of where in Wisconsin you practice golf turf management, the abnormal weather was taken by many as a bad omen.

Winter didn't arrive in our town until late and we were even beginning to wonder if it was going to get here at all. The average freeze day for the lakes in our town are November 27th for Wingra, December 15th for Monona and December 20th for Mendota. This winter was ridiculous. Wingra went solid on December 18th and it was January 14th before the ice formed in Monona and Mendota. The late freezes pressured the record book for late closings. The latest for Mendota and Monona was January 30, 1932 and Wingra waited until

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December 29th in 1897.

It was only two years ago that the lakes were ice covered for only 47 days, and that broke the old record by over a week. We flirted with a new record for shortest freeze duration this year, barely missing the 47 days.

The shorter winters are going to dictate how we budget our golf course operations. In the past, we hire students for working the three months of summer and covered the operation pretty well. It is a different story when the season begins the first week of March and runs through the first week of December. It is not going to work having adequate employees for only three of the nine or more months we could be open.

The shorter and milder winters are affecting others besides us. They affect those who enjoy and those who provide ice sports. Ice boating, ice fishing and ice skating are three examples of sports suffering from the lack of ice. And if you like skiing and sledding, consider that in our town you need to go back to 1967/68 for a winter with less snow. We had only 26" inches of the white stuff in 1999/00.

The open water and the warm temperatures are confusing the geese too - they don't fly south anymore, it seems.

And think of the people who enjoy hard water golf - they really have something to complain about!

It was a stunning announcement. And unexpected, at least by me. Whistling Straits has been picked as the site of the 2004 PGA Championship, one of golf's four major championships. What an outstanding opportunity for golf in Wisconsin.

The Kohler Company was happy to host the 2005 U.S. Open but since the USGA hadn't decided, the PGA was happy to switch the 2004 PGA from Valhalla CC to the Haven golf course.

It should be a great venue for the

tournament. Many of us were Mike Lee's guest during construction of the course, and more than a few have gone back since its opening to see how it turned out.

It turned out great! The course can accommodate between 27,000 and 45,000 spectators. My guess is that they'll run out of tickets, just like Blackwolf Run did during the U.S. Women's Open in 1998.

Herbert V. Kohler, chairman of the

Kohler Co., is especially happy to have the PGA since it is played in August rather than the spring. "When you're dealing with fescue grass, it will have had time to brown out and meld into several different colors of brown. It gives you a very vivid, picturesque scene."

Throw into that scene the game's best players, the beauty of Lake Michigan and the skills of Mike Lee and his staff and you have the

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potential for an unforgettable event in golf history.

And speaking of golf history, it may come as a surprise to some to learn that the PGA championship has been held on a Wisconsin golf course in the past. Gene Sarazen defeated Willie Goggin, 5 and 4, at Blue Mound Golf and Country Club in 1933. Sarazen, a GCSAA Old Tom Morris award winner, has been one of golf's enduring heroes.

Steve Millett has made many contributions to the Wisconsin turfgrass industry during his six or seven years at Wisconsin while earning his PhD in plant pathology. He also made a lot of friends. This bit of history about him might interest you.

Steve earned the last PhD of the century in the Plant Pathology Department, securing his place in the history of that department. Dr. Doug Maxwell investigated the first PhDs of the century. They were granted in 1912 to Dr. Melhus and Dr. Morse. Both men were students of Dr. L.R. Jones. One thesis concerned a potato disease and the other studied germination and infection in certain oomycetes. They were the alpha of the department and Steve is the omega, as Dr. Maxwell pointed out.

The well known turf pathologists Monteith and Dahl were also UW - Madison plant pathology grads.

The recently completed GCSAA conference saw Wisconsin honored through some of our superintendents.

James M. Krutilla was a 2000 Environmental Steward Award merit winner in the public category. He is the superintendent at Edgerton's Towne Country Club.

Mike Lee was a speaker at the Innovative Superintendent Sessions and gave a super talk. He runs the Kohler Co. golf courses. And all of the authors and advertisers of The Grass Roots were honored when the

Wisconsin chapter publication was selected winning entry in category 2. It was the 16th consecutive GCSAA award.

Howard Atten passed away last January 17th in Elkhorn. Howard was a 50 years member of both the GCSAA and PGA. He played golf at the Evergreen Golf Club and was a good friend of Bill Rogers. Bill was a pall bearer at Howard's funeral.

"Howie lived and breathed golf," Bill said. "He always felt strong about the value of a good superintendent." He designed and built the Edgewater Golf Club at Grafton and wrote a book titled *Golf Simplified*.

Our thoughts are with the family.

I don't know about anyone else, but when our golf course budget was built last fall, I didn't plan on fuel prices where they are now. They are sky high and rising.

The pricing is due to a reduction in supply. Don't you just love it? We pull the oil-producing Arab states out of a jam with Iraq and are rewarded with restricted production. Mexico floods us with drugs and illegals and required an economic bailout to stay afloat. Their country thrives on NAFTA. And how are we shown gratitude? Reduced oil production. And although I don't know it for a fact, I wouldn't be surprised if there is Alaska oil, or at least a portion of it, that is being exported, making all kinds of common sense when we are over \$1.50 a gallon for gas.

Where's Willie? Where's Al (after all, he wants to be your pal). And Al wants Willie's job...

Let's face it - Easter will seem like the middle of the summer this year. The best we can hope for is a mild season with ample and gentle rain. I'll lead the prayers. 🌿



OF COURSE, THERE ARE SOME  
DISADVANTAGES TO HAVING  
A MILD WINTER....



# Soil Cation Balance

By Dr. Wayne R. Kussow, Department of Soil Science, University of Wisconsin-Madison

## BACKGROUND

The concept of cation balance, its importance with regard to plant growth, and its use as a tool for managing soil fertility are not new or revolutionary. The origins of the concept date back to the 1890s with research conducted in Germany. Through the years numerous researchers have tested and refined the concept.

The basic elements of the cation balance concept as we know it today were first elucidated by researchers at Rutgers University. They conducted several field trials to determine what was required to grow alfalfa on acid, sandy soils. They concluded from the results of their research that the "ideal" soil for alfalfa production is one that is 80% saturated with cations (80% of the soil cation exchange sites are occupied by Ca, Mg, K, and Na) and among these cations, 65% should be Ca, 10% Mg, and 5% K (Bear and Toth, 1948). They also noted that, from these values, the Ca:Mg ratio should be 6.5 to 1. In about the same time frame, Albrecht and Smith (1952) conducted a series of studies, primarily with soybean, and concluded that the ideal cation saturations are really not fixed numbers but can range between certain values without affecting plant growth. They came up with the standards in

use today. They kept the 80% cation saturation standard, claiming that 20% saturation with H<sup>+</sup> ions was necessary to "mobilize" nutrients, and expounded on the idea that soil pH was not nearly as important as % base saturation. Besides 80% base saturation, they indicated that the Ca saturation should range between 65 and 85%, Mg between 6 and 12%, and K between 2 and 5%. These are the standards most often employed by today's promoters of the cation balance concept.

## THE EVIDENCE

Numerous researchers have studied the effects of base and cation saturations on crop yield and nutrient content. For the purposes here, I'm drawing upon three of the studies. The first involved the growing of barley, red clover, corn, and timothy in the greenhouse on eight New York State soils adjusted to various pH levels and combinations of cations (Moser, 1933). The other two studies were conducted at Ohio State University by McLean and Carbonell (1972) and by Eckert and McLean (1981). In the McLean and Carbonell (1972) study, two soils were adjusted to nearly constant % base saturations, while the % saturations with Ca and Mg varied widely. Eckert and McLean (1981) employed a single soil treated to pro-

Table 1. R<sup>2</sup> values for the relationship between crop yield and soil base saturation, pH, Ca, and Mg.

Soil property	R <sup>2</sup> values		
	Moser (1933)	McLean and Carbonell (1972)	
		German millet	Alfalfa
% base saturation	0.790	--	--
pH	0.752	--	--
% Ca saturation	0.636	0.009	< 0.001
Exchangeable Ca	0.859	0.729	0.880
% Mg saturation	0.590	0.001	0.001
Exchangeable Mg	0.704	0.259	0.335
Exchangeable Ca:Mg ratio	0.173	0.008	0.018



Table 2. Ranges in soil properties associated with highest and lowest yields of German millet and alfalfa.

Soil property	German millet		Alfalfa	
	Lowest yield	Highest yield	Lowest yield	Highest yield
% base saturation	58 to 88	38 to 60	35 to 60	58 to 68
% K saturation†	2.1 to 4.6	2.9 to 5.0	2.0 to 5.0	2.2 to 4.6
% Mg saturation	1.5 to 3.9	2.9 to 13.8	2.7 to 14.6	1.8 to 9.9
% Ca saturation	53 to 84	27 to 49	23 to 53	49 to 84
Ca:Mg ratio	18 to 54	3 to 11	3 to 20	7 to 53

† Range tested = 2 to 5.

vide wide ranges in % base saturation as well as Ca and Mg ratios. In both studies, the crops grown were German millet and alfalfa.

The data from the Moser (1933) and the McLean and Carbonell (1972) studies are well suited to examination of soil treatment effects on crop yield. I applied a standard statistical technique to determine the nature of these relationships. In this technique, a statistical value,  $R^2$ , is calculated. A perfect relationship results in an  $R^2$  value of 1.0. The closer the value is to 1.0, the stronger the relationship and the higher the degree of confidence we have in declaring that it is truly a cause-and-effect relationship. This, then, provides the basis for selecting which measure of a nutrient provides the most reliable estimate of the plant available supply of the nutrient in soil.

The  $R^2$  values calculated for the crop yield data gathered by Moser (1933) and McLean and Carbonell (1972) are shown in Table 1. From these values, the following becomes obvious:

1. There was no real difference between crop response to % base saturation and soil pH.
2. The crops were much more responsive to the amounts of exchangeable Ca and Mg than to their % saturations.
3. Ca:Mg ratios of 1.0 to 5.0 in the Moser (1933) study and from 2.2 to 15.0 in the McLean and Carbonell (1972) studies had no influence on crop yields.

The results of the Eckert and McLean (1981) study are suited to interpretation in another manner. They found that crop yields could be separated into two groups highest and lowest. Within each of these groups, there were no significant differences in crop yields. This situation allows examination of the ranges

in base and cation saturations for each group for which crop yields were essentially constant. This examination also reveals the amount of overlap in base and cation saturations between the highest and lowest yields.

Examination of the ranges in % base saturation, individual cation saturations, and Ca:Mg ratios associated with the highest and lowest crop yields (Table 2) quickly reveals that:

1. There were no unique base or cation saturations or Ca:Mg ratios associated with the highest or lowest yielding treatments.
2. The highest and lowest yields were often obtained with the same set of soil properties.

These observations led the authors to conclude that crops respond primarily to the amounts of exchangeable Ca, Mg, and K in soil, not their % saturations.

There is an inherent assumption in the cation ratio concept that plants accumulate cations in accord with their ratios in the soil solution, which is why certain ratios of the ions need be maintained on the cation exchange sites. Research conducted by Barber (1984) has shown that the dominant mechanism whereby Ca and Mg ions move through soil to plant roots is different from that for K. The result is that the concentrations of these ions at root surfaces where they might be taken up are not the same as they are in the bulk soil solution. Not only this, but the ratios of these ions at the root surface are very different from their ratios in the soil solution and on the cation exchange sites.

This brings us to an interesting and important question. Do plants take up cations in the same ratio as they are delivered to roots? More than one researcher has answered this question. The work of Steiner (1980) is one such study. He grew lettuce and tomato

in nine nutrient solutions that differed widely in the ratios of Ca, Mg, and K and measured the amounts of these nutrients taken up by the two crops. What he observed is shown in Figure 1. The Ca, Mg, and K contents of the plants showed no relationship to the ratios of the ions in the nutrient solutions. In fact, the quantities of Ca, Mg, and K taken up were nearly constant. The interpretation of these observations is that the plants accumulated the nutrients in accord with their physiological need, not according to the ratios of Ca, Mg, and K in the nutrient solutions.

### CONCERNS

Even if we ignore the large volume of evidence that base and cation saturations are not valid criteria for managing turfgrass nutrition, other concerns exist. The first arises from the fact that many golf putting greens are constructed with calcareous sands or, through a few years of irrigation with Ca- and Mg-laden water, they become calcareous. When standard soil testing methods are used for calcareous soils, the results are erroneous. Soil exchangeable Ca levels are overestimated and the soil CEC underestimated (Hendershot and Lalonde, 1993). This can lead to incorrect soil interpretations and invalid recommendations.

It is true that if mineral soils of temperate climate regions are adjusted to a base saturation of around 80%, their pH will generally fall in the range of 6.5 to 7.0. But this is not true for the more highly weathered soils such as those that may be found in the southeastern part of the USA or for organic soils. These soils tend to attain a pH of 6.5 to 7.0 with base saturations much closer to 50% than 80%. Adjusting their base saturations to 80% results in pH values in excess of 7.0. Sand-peat putting green root zone mixes behave like organic soils. Thus, strict application of the 80% base saturation concept to them runs the risk of elevating their pH to undesirable levels.

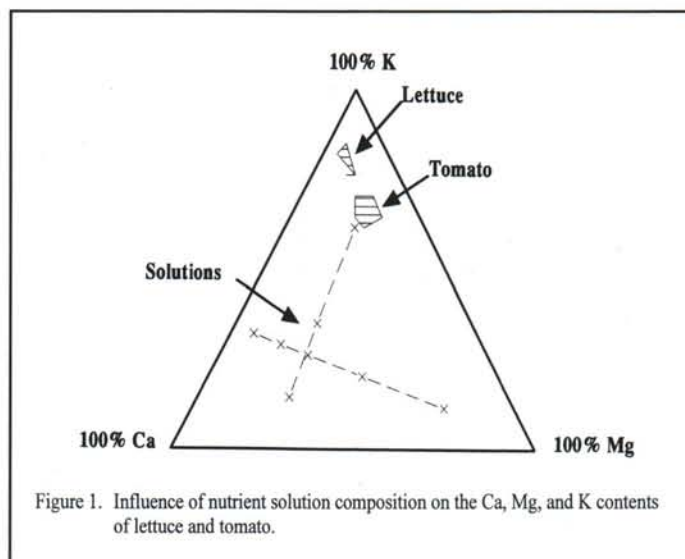


Figure 1. Influence of nutrient solution composition on the Ca, Mg, and K contents of lettuce and tomato.

The third concern is with low CEC root zone mixes. Application of cation saturation criteria to them can result in applying or maintaining inadequate amounts of K and, in some cases, of Mg as well. The trend toward use of root zone mixes with less than the traditional 20% peat can only increase the chances that recommendations based on cation saturations will increase the incidences of K and Mg deficiencies.

A final concern is one that may have already crossed your mind. All of the research cited here was conducted with agronomic and horticultural crops. Where's the research done with turfgrass? The kind of crop grown is important because it is a well-known fact that there is considerable variation in crop requirements for Ca and Mg. For example, legumes such as alfalfa are noted for having high Ca and Mg requirements. In contrast, turfgrass has much lower Ca and Mg needs, and extrapolation to turfgrass from legumes is risky.

The fact of the matter is that there are no published reports of investigations of turfgrass response to ranges in soil base or cation saturations. The closest we can come is the research currently being conducted by St. John et al. (1999). They're growing turfgrass on calcareous sands and, in accord with cation balance theory, are applying gypsum, lime, calcium nitrate, and calcium chelate. None of these treatments has thus far affected growth or the calcium content of Kentucky bluegrass or creeping bentgrass clippings.

### CONCLUSIONS

The evidence is overwhelming that the base saturation-cation balance theory is just that – a theory for which there is no substantiating evidence. It's the amounts of exchangeable Ca, Mg, and K in soil that are important, not their ratios. Virtually any soil with

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