

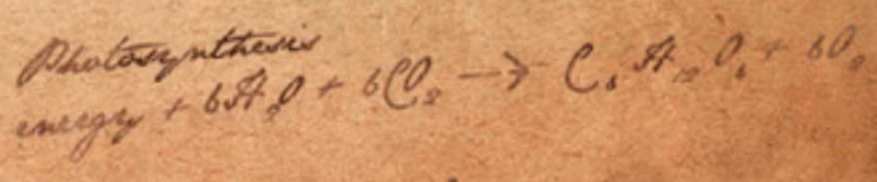
Rooted in Science

Periodic Table Atomic Properties of the Elements

Elements essential to plant health

| | | | | | | | | | | | | | | | | | |
|----------------------------|------------------------------|-----------------------------|-----------------------------------|-----------------------------|--------------------------------|-------------------------------|------------------------------|--------------------------------|---------------------------------|--------------------------------|-------------------------------|-----------------------------|------------------------------|------------------------------|----------------------------------|-----------------------------|---------------------------------|
| Group 1 IA | 2 IIA | 3 IIIB | 4 IVB | 5 VB | 6 VIB | 7 VIIB | 8 VIII | 9 VIII | 10 VIII | 11 IB | 12 IIB | 13 IIIA | 14 IVA | 15 VA | 16 VIA | 17 VIIA | 18 VIIIA |
| 1 H Hydrogen | | | | | | | | | | | | 5 B Boron | 6 C Carbon | 7 N Nitrogen | 8 O Oxygen | 9 F Fluorine | 10 Ne Neon |
| 2 Li Lithium | 4 Be Beryllium | | | | | | | | | | | 13 Al Aluminum | 14 Si Silicon | 15 P Phosphorus | 16 S Sulfur | 17 Cl Chlorine | 18 Ar Argon |
| 3 Na Sodium | 12 Mg Magnesium | | | | | | | | | | | 31 Ga Gallium | 32 Ge Germanium | 33 As Arsenic | 34 Se Selenium | 35 Br Bromine | 36 Kr Krypton |
| 4 K Potassium | 20 Ca Calcium | 21 Sc Scandium | 22 Ti Titanium | 23 V Vanadium | 24 Cr Chromium | 25 Mn Manganese | 26 Fe Iron | 27 Co Cobalt | 28 Ni Nickel | 29 Cu Copper | 30 Zn Zinc | 49 In Indium | 50 Sn Tin | 51 Sb Antimony | 52 Te Tellurium | 53 I Iodine | 54 Xe Xenon |
| 5 Rb Rubidium | 38 Sr Strontium | 39 Y Yttrium | 40 Zr Zirconium | 41 Nb Niobium | 42 Mo Molybdenum | 43 Tc Technetium | 44 Ru Ruthenium | 45 Rh Rhodium | 46 Pd Palladium | 47 Ag Silver | 48 Cd Cadmium | 81 Tl Thallium | 82 Pb Lead | 83 Bi Bismuth | 84 Po Polonium | 85 At Astatine | 86 Rn Radon |
| 6 Cs Cesium | 56 Ba Barium | | 72 Hf Hafnium | 73 Ta Tantalum | 74 W Tungsten | 75 Re Rhenium | 76 Os Osmium | 77 Ir Iridium | 78 Pt Platinum | 79 Au Gold | 80 Hg Mercury | | | | 114 Uuq Ununquadium | | 116 Uuh Ununhexium |
| 7 Fr Francium | 88 Ra Radium | | 104 Rf Rutherfordium | 105 Db Dubnium | 106 Sg Seaborgium | 107 Bh Bohrium | 108 Hs Hassium | 109 Mt Meitnerium | 110 Uun Ununallium | 111 Uuu Unununium | 112 Uub Ununbium | | | | | | |

Atomic Number: 58
Symbol: **Ce**
Name: Cerium



Symptoms of nutrient deficiency include:
 Chlorosis, necrosis, stunted tillering,
 lack of growth or over loss of stand resulting
 in weed invasion

FLORATINE UNDERSTANDS THAT YOUR PROFESSIONAL REPUTATION AND LIVELIHOOD DEPEND ON THE TURFGRASS YOU MANAGE. That is why for 20 years Floratine has never cut corners using “cheaper” ingredients or “one size fits all” products. Because you have so much at stake, we deliver the essential elements for your success by using only the finest raw materials to create our patented foliar and soil technologies that are rooted in science. All of which is supported by a highly trained global distribution network dedicated to keeping you rooted in solutions.



Visit our award winning website, Floratine.com to learn more and to find a distributor near you.

Continued from page 50

To understand how this can work, you need to know a bit about the structure of crystalline silicate clays. Clay is actually composed of microscopic sheets of primarily silicon and aluminum oxides that form layers. A collection of layers form a micelle that is negatively charged. Calcium or other di- and trivalent cations can help clay flocculation by bridging micelle together to create very stable microscopic floccules (Brady and Weil, 2008).

It is these floccules that bind together other soil particles (e.g., sand, silt, organic matter) to form microaggregates. However, monovalent ions like sodium can cause clay particles to repel each other and encourage dispersion.

It's well known that soils with high soil organic matter (SOM) are of better quality, in part, because of their effect on soil structure. It's important to know that partially or undecomposed plant litter has little influence on soil structure. It's the by-products of decomposition that have the most effect. What really happens is soil microorganisms will break down plant material and leave behind or exude compounds like proteins, polysaccharides or humus. These compounds will coat soil particles allowing them to stick together in clumps.

One important compound worth mentioning is glomalin, a sticky glycoprotein that facilitates the formation of water stable aggregates (Wright and Upadhyaya, 1998). Without this compound, the ability of soil to form aggregates would be severely limited. Adding clippings, compost or degraded manure will increase the amount of these compounds and promote aggregate formation. In short, you're "feeding" the soil microorganisms in order for them to facilitate soil aggregation.

While adding organic matter can feed soil microorganisms, the application of artificial nitrogen fertilizer can alter their activity. Excessive or over-fertilization may inhibit the activity of these important organisms. The glomalin producing microorganism is actually arbuscular mycorrhizae (AM), a fungus that forms a symbiotic relationship with plant roots. Plants supply the mycorrhizae with energy (i.e., carbon) and the mycor-

rhizae supplies plants with nutrients mined from organic matter.

If grasses have excess amounts of nutrients, they generally allocate more photosynthate to leaves and less to roots or AM fungi (Johnson et al., 2003). In regards to soil structure, research shows that adding just 100 kilograms of nitrogen per square hectare (kg N ha⁻¹) is known to increase the growth of AM fungi that excretes glomalin (Wilson et al., 2009).

However, another study found that adding 200 kilograms of kg N ha⁻¹ can decrease the AM fungus that produces glomalin, but not always (Treseder et al., 2007). Nevertheless, a general rule of thumb is excessive fertilization will reduce AM fungi biomass (Johnson et al., 2003), and thus could reduce the production of glomalin and the formation of soil aggregates.

Jared L. DeForest, Ph.D., is an assistant professor of soil ecology in the department of environmental and plant biology at Ohio University. He can be reached at deforest@ohio.edu.



QUICK TIP

Insect and pest infestations can place serious stress on turfgrass, opening the door to further disease and other issues. If your turf is already stressed from lack of proper nutrition, this can compound the problem. Healthy, nutritionally sound turfgrass can overcome problems like insect damage much more easily than nutrient-deficient turf. A proactive nutrition plan is essential to minimizing plant stress and maintaining the health of your turf. Read more at www.floratine.com.

REFERENCES

- Brady, N. and Weil R. 2008. *The Nature and Properties of Soils*. 14 ed. Prentice Hall, Upper Saddle River, NJ.
- Díaz-Zorita, M., Perfect E., and Grove J.H. 2002. Disruptive methods for assessing soil structure. *Soil and Tillage Research*. 64, 3-22.
- Wright, S.F. and Upadhyaya, A. 1998. A survey of soils for aggregate stability and glomalin, a glycoprotein produced by hyphae of arbuscular mycorrhizal fungi. *Plant and Soil*. 198, 97-107.
- Johnson, N.C., Rowland D.L., Corkidi L., Egerton-Warburton L.M., Allen E.B. 2003. Nitrogen enrichment alters mycorrhizal allocation at five mesic to semiarid grasslands. *Ecology*. 84, 1895-1908.
- Wilson, G.T.W., Rice C.W., Rilling M.C., Springer A, and Harnett D.C. 2009. Soil aggregation and carbon sequestration are tightly correlated with the abundance of arbuscular mycorrhizal fungi: results from long-term field experiments. *Ecology Letters*. 12, 452-461.
- Treseder, K.K., Turner K.M., and Mack M.C. 2007. Mycorrhizal responses to nitrogen fertilization in boreal ecosystems: potential consequences for soil carbon storage. *Global Change Biology*. 13, 78-88.
- Riederer, M. and C. Muller. 2006. *Biology of the Plant Cuticle*. Blackwell Pub., Oxford, Ames, Iowa.
- Schönherr, J. 2006. Characterization of aqueous pores in plant cuticles and permeation of ionic solutes. *Journal of Experimental Botany* 57:2471-2491.
- Totten, F.W. 2006. Long-term evaluation of liquid vs. granular nitrogen fertilization in creeping bentgrass. Ph.D. Dissertation. Clemson University, Clemson, SC.
- Totten, F. W., H. Liu, L. B. McCarty, J. E. Toler, and C. M. Baldwin. 2008. Efficiency of foliar versus granular fertilization: a field study of creeping bentgrass performance. *J. Plant Nutri.* 31(5): 972-982.

TURFGRASS TRENDS

INDUSTRY ADVISORS

Jerry Quinn
John Deere

Scott Welge
Bayer Environmental Science
Kevin Cavanaugh
Floratine



SePRO Corporation Carmel, IN 46032

The Legacy has been passed on

New Legacy Turf Growth Regulator incorporates patented synergistic growth regulation technology resulting from its dual sites of action and absorption. No other product can match Legacy's combination of enhanced growth suppression, extended spray intervals, improved turfgrass color and quality, suppression of *Poa annua* and more uniform growth regulation on mixed turfgrass stands. The next generation of turf growth regulators is here in the form of an innovation that will be passed down for years to come.

Make it a part of your golf course's tradition by visiting www.sepro.com or calling 1-800-419-7779 to learn more about Legacy or any of SePRO's products, services and technologies.

Legacy*

The Next Generation of
Turf Growth Regulation Technology



*Trademark of SePRO Corporation. Always read and follow label directions. The synergy derived from the combination of Type IIA and Type IIB PGRs is covered under U.S. Patent No. 7,135,435. ©Copyright 2008 SePRO Corporation.

The Company Line

NUTSEGE CONTROL

Nutsedge can cause superintendents' headaches. The following are products that can aid superintendents in their efforts to control the perennial weed:

Basagran[®] T/O Herbicide

Basagran T/O herbicide from **BASF Professional Turf & Ornamentals** offers reliable, cost-effective post-emergent control of yellow nutsedge, annual sedges, broadleaf weeds and more, according to the company. It also provides weed control in ornamentals. When used as directed, Basagran T/O helps superintendents in the following ways:

- Provides a cost-effective yellow nutsedge program.
- Effectively eliminates underground tubers.
- Delivers effective post-emergent activity, which allows flexible weed control.
- Offers use in both cool- and warm-season turfgrass.
- Easily tank-mixed with other herbicides for added spectrum of control.



Monument 75WG herbicide (trifloxysulfuron-sodium) from **Syngenta Professional Products** is a selective post-emergent herbicide for control of sedges, including purple, yellow, annual and kyllinga species. Additionally, it can be used in bermudagrass, zoysiagrass and buffalograss for control of certain unwanted grasses, sedges and broadleaf weeds. It is packaged in 5-by-5 gram packets and consists of water dispersible granules that

must be thoroughly mixed with water and applied as a spray. A repeat application may be necessary four to six weeks after application for optimum weed control. Monument controls other common weeds including common chickweed, dichondra, dandelion and wild garlic, plus grass weeds such as tall fescue, annual bluegrass, smooth and large crabgrasses, perennial ryegrass and roughstalk bluegrass.

Velocity Herbicide from **Valent Professional Products** provides strong and effective control of nutsedges in creeping bentgrass and perennial ryegrass. Jason Fausey, Valent's regional field market development specialist, recommends superintendents apply Velocity 17.6 percent SG formulation twice on a 14-day application interval at 6 ounces/acre to actively growing nutsedges. Velocity also controls *Poa annua* and *Poa trivialis* from creeping bentgrass and effectively transition a *Poa*-dominated mixed stand of turf to pure bentgrass. Plus, it suppresses dollar spot and selectively controls other broadleaf weeds.

PBI/Gordon offers three herbicides for yellow nutsedge suppression: **Surge Broadleaf** herbicide, **Q4 Broadleaf** herbicide and **T-Zone Broadleaf** herbicide. The key is sulfentrazone, which allows these herbicides to provide up to 60 percent suppression of young and actively growing yellow nutsedge. University testing shows consistent suppression of



yellow nutsedge and users have often reported complete control, according to the company. While all three formulations are designed to give fast activity, each has its own characteristics:

- Surge is an amine option for control in warmer weather with enhanced speed compared to other water-based products.
- Q4 contains quinclorac for control of grassy weeds in addition to broadleaves.
- T-Zone, available in the fall, contains triclopyr for control of tough weeds.

FMC Professional Solutions offers **Dismiss** herbicide for faster visible sedge control, according to the company. Dismiss takes charge of yellow nutsedge and green kyllinga. It produces visible results on sedges in as little as 24 to 48 hours. Dismiss is also unique in the way it controls sedges, the company says. Not only does it attack the weed on the surface, it also penetrates the soil and helps control sedge tubers. This helps to prevent future outbreaks, reducing the need for re-treats down the line and minimizing additional labor and chemical costs, according to the company. Dismiss is well-tolerated on 13 common turfgrasses.

Nufarm Americas offers **Nufarm Halosulfuron Pro** for controlling nutsedge and other weeds. "Nutsedge is a nuisance weed that is really problematic in many settings," says Dunk Porterfield, Ph.D., product development manager for Nufarm. "But Halo-

sulfuron Pro is state-of-the-art in controlling both purple and yellow nutsedge." Nufarm Halosulfuron Pro is in two pack sizes: a user-friendly 0.9 gram water-soluble packet that treats up to 1,000 square feet, and a 1.33-ounce bottle for larger-scale applications.

DeWitt Weed Barrier 12 Year is an easy-to-use, environmentally safe fabric that controls weeds before they start. It's fabricated using a spun-bond method, which sandwiches melt-blown material, forming a powerful three-ply layer of weed protec-



tion, according to the company. Plus, the fabric's higher carbon black content provides light-blocking capabilities to protect against the toughest perennial weeds. The design also prevents unraveling and makes the material easier to cut. In addition, DeWitt Weed Barrier 12 Year is hydrophilic-treated, providing improved water and nutrient flow through the fabric.

The Company Line

PRODUCTS

Turfco offers the new Walking TriWave Overseeder, which combines the features of Turfco's TriWave 60-inch Overseeder in a walking version. In addition to the patented WaveBlade technology, the Walking TriWave Overseeder offers new optional greens blades, new transport speed and patent-pending technology that keeps seed rate consistent regardless of ground speed. The new overseeder enables operators to handle all kinds of seed from bentgrass to a creeping red fescue.

Club Car's Guardian SVC (Satellite Vehicle Control) system brings an advanced level of protection to golf courses and their most valuable assets — their customers, course and golf cars — as part of an affordable GPS-based system, the company says. Guardian incorporates course-management features of GPS technology — including limiting vehicle access, controlling vehicle speed, reviewing the history of where a golf car has been driven, and monitoring and diagnosing vehicle performance — into a system that can be accessed from any computer with an Internet connection.

Vitalonil fungicide, from **Phoenix Environmental Care LLC**, is a proprietary combination of the company's Vital and Pegasus products. It offers control of a broad spectrum of diseases, including pythium, dollar spot, rhizoctonia diseases and anthracnose. Vitalonil is a combination of potassium phosphite and chlorothalonil, which makes it an excellent product for resistance management, according to the company.

Bayer Environmental Science offers Chipco Triton FLO, a new fungicide for flexible disease control. Not only does the new product control all the major turf diseases, it improves plant health, allowing turf plants to more effectively manage the stresses of golf course conditions. Chipco Triton FLO fungicide is a sterol biosynthesis inhibitor from the demethylation inhibitor (DMI) class of chemistry. It contains the active ingredient triticonazole, formulated with StressGard technology.

E-Z-GO offers the MPT 2000 Refresher, which allows golf courses and resorts to serve the needs of customers — and drive revenue from on-course food and beverage sales — longer without having to stop for lengthy and laborious refills. The MPT 2000 Refresher offers a total payload capacity of 2,000 pounds.

BASF Turf & Ornamentals says Drive XLR8 herbicide has received full state registration in California. Broad-spectrum Drive XLR8 herbicide features an innovative liquid formulation of quinclorac for postemergent control of the most prevalent weeds.

GOLFDOM (ISSN 1526-4270) is published monthly (12 issues per year) by Questex Media Group, Inc., 306 W Michigan Street, Suite 200, Duluth, MN 55802. Corporate office: 275 Grove St, Suite 2-130, Newton, MA 02466. Accounting, Advertising, Production and Circulation offices: 306 W. Michigan St, Suite 200 Duluth, MN 55802-1610. **Subscription rates:** One year \$43 (U.S. and possessions), \$65 (Canada and Mexico) and \$98 (all other countries). Air expedited service is available in countries outside the U.S. and Canada for an additional \$75 per year. Current issue single copies (prepaid only) \$5 (U.S. and possessions), \$7 (Canada and Mexico) and \$8 (all other countries). Back issues (if available, prepaid only) \$10 (U.S. and possessions), \$14 (Canada and Mexico) and \$16 (all other countries); add \$6.50 per order shipping and handling for both current and back issue purchases. Periodicals postage paid at Duluth MN 55806 and additional mailing offices.

POSTMASTER: Please send address changes to *Golfdom*, P.O. Box 1268, Skokie, IL 60076-8268. Canadian G.S.T. Number: 840033278RT0001, Publications Mail Agreement number 40017597. Printed in the U.S.A. **Copyright 2009 by Questex Media Group, Inc.** All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher. Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Questex Media for libraries and other users registered with the Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA 01923, phone 978-750-8400, fax 978-750-4470. Call for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law. For those not registered with the CCC, send permission request to questexpermissions@reprintbuyer.com or 800-494-9051, ext 100.

Ad Index

| Advertiser | Page No. | Advertiser | Page No. |
|-----------------------|--------------|---------------------------|---------------|
| Smithco | 23, 40 | | |
| Agraquest | 29 | SolarBee | 30 |
| Agrium Adv. Tech. | 13 | Target Specialty Products | 35 |
| Andersons | CV4 | Tee-2-Green | Insert, CV2-1 |
| BASF | 5, 14-15, 21 | Toro | 19 |
| Hustler | 11 | Turfco Mfg. | 36 |
| Klingstone | 28 | Valent | 9 |
| Kochek | 41 | White Metal Golf | 39 |
| LebanonTurf | 40, CV3 | | |
| Milorganite | 4 | TURFGRASS TRENDS | |
| PBI/Gordon | 3 | Floratine | 51 |
| Phoenix Environmental | 7 | | |
| Plantstar | 39 | | |
| PrimeraTurf | 24 | | |
| ProGro | 8 | | |
| Rainbird Sales | 45 | | |
| SipcamAgro | 31 | | |

This index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

Top 6 Reasons to Sign Up for Our New Digital Edition!

1. More timely (up to 10 days earlier than the mailed copy)
2. Easy to save & archive issues
3. Ability to search issues
4. Easy to forward to others
5. Environmentally friendly

And, last but not least, it is **FREE.**

Golfdom



Sign up today at...

www.golfdom.com/digital

New York, New York

If you watched the 2009 U.S. Open, you know it was one hellish week for everyone involved. Miserable rains leading up to the event returned Thursday morning to wreak havoc on Bethpage State Park.

Has there ever been a more brutal set of tournament circumstances for a superintendent and crew to deal with? Doubtful.

Yet Craig Currier, his 60-person staff and the 100-plus volunteers somehow held the Black Course together, squeegeeing enough to prevent a Tuesday finish. Inside-the-ropers could only marvel at the firmness of the non-USGA greens and shudder at the thought of so little sleep working those oddball hours — even by golf course maintenance standards.

For the second time in seven years, the folks at Bethpage presented a state-owned course worthy of a national championship. And though the rain-delayed event finished a day late, Bethpage produced a quality winner in Lucas Glover. He captured the Open trophy with grace, humility and eyes sore from finishing four books in a week.

I spent the week traveling to the Black Course via the incredibly efficient Long Island Railroad from New York City while most of my colleagues languished out on the island at a hotel that dared to run out of certain wines and beers. My experience proved eye-opening.

The city that never sleeps never really changes either. It's gritty, loud, funny, overwhelming and energizing. Yet the infrastructure is grimy at best, dilapidated at worst. Yet it all man-

GOLF CAN LEARN FROM THIS GRITTY, LOUD, FUNNY, OVERWHELMING AND ENERGIZING CITY THAT HOSTED THE 2009 U.S. OPEN AT BETHPAGE BLACK

BY GEOFF SHACKELFORD



ages to work and everyone marches on like extras in some sort of strange little movie set, oblivious to its faults as long as they get from point A to B.

Talking to the golf fans attending the Open, I was impressed by the sense that they aren't ashamed of the city's stuck-in-time, Gotham aesthetic. In many cases they are downright proud that the place is so unpolished.

And here's the unvarnished truth: golf needs to learn from New York City.

A lot less polish and varnish will not kill the game. Even in these tough times, golf's still too popular and too good to be undermined by a few rough edges. Of course this doesn't mean that golfers will accept all-out lousy course conditions, it just means that the combination of a massive recession and a greater demand for environmental sensitivity means we are seeing fewer golfers panic over a little bit of scruffiness.

That said — massive segue here — I've spent time at some run-down muni's lately and I'm sad to say that not all of our subways are running on time despite a golf industry swelling with knowledge and expertise.

It was heartening to find out about local superintendents who loan equip-

ment, supplies and expertise to golf's less fortunate. Couple that with the incredible volunteer spirit at Bethpage and there is not enough recognition of the efforts many are making to help out the public game.

While golf has no shortage of slick, feel-good, over-marketed outreach programs, I've never seen a press release about superintendents at clubs helping out their less fortunate neighbors.

While I know it's not the superintendent's nature to brag, if you don't mind, nominations and tips would be appreciated. Tell me about golf industry folks who are helping out, whether it's donating some sod or sharing a sprayer. You can e-mail me at geoffshac@me.com.

Maybe we can find a way to share this information online and inspire even more of this vital outreach. Because if golf wants to survive this recession, it needs to make sure that the game is functioning at the most basic level.

We need to keep our subways running.

Visit Shack's Web site at www.geoffshackelford.com. Follow him on Twitter at [GeoffShac](https://twitter.com/GeoffShac).

Some things just don't work when they're cut in half



But some things do...

LebanonTurf's exclusive MESA fertilizer products provide a consistent, brilliant color that will help your course perform at its best. MESA does not rely on a coating or lose its slow release attributes when cracked. Cut a piece of MESA in half, it's still MESA! Look for these MESA products in LebanonTurf's ProScape brand:



- 17-0-17 100% MESA with Green-Smart™ Technology 145 SGN
- 20-0-10 60% MESA with Green-Smart™ Technology 145 SGN
- 6-1-11 Organic Biosolid MESA 7% Complex Iron
- 19-0-19 62% MESA 3% Iron

For more information about MESA, call 1-800-233-0628, or visit our web site at www.LebanonTurf.com. For your free agronomy manual, click on promotions and enter code GF2079.

LebanonTurf

Improving the Way Professionals Care for Turf