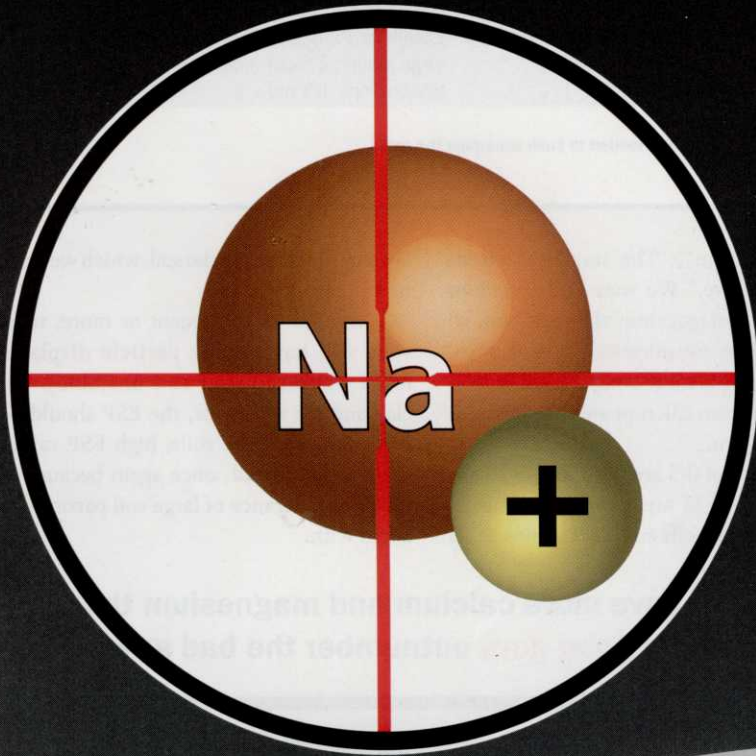


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General Salinity Hazard of Irrigation Water

HAZARD LEVEL	TDS ppm or mg/L	EC(w) dS/m or mmhos/cm	Leaching Requirement
LOW - Little chance of soil salinity buildup.	160 or less	0.25	None - with normal rainfall.
MEDIUM - May cause problems on salt sensitive plants.	160 - 500	0.25 - 0.75	Moderate leaching required.
HIGH - May cause adverse effects and require special management.	500- 1,440	0.75 - 2.25	Good drainage required and moderate leaching. Plant salt tolerant species.
VERY HIGH	1,400 or above	2.25 or above	Excellent drainage required with large leaching requirement. Salt tolerant species only.

TDS = Total Dissolved Solids (salts). EC(w) = electrical conductivity

Leaching = Water required above and beyond normal irrigation amounts needed to flush salts past the roots.

FN: Salinity table water Q 210

keeps the soil particles separated spatially. This happens because the water “bubbles” collide and stop, keeping the soil particles “suspended” more or less in between them. When this happens, the soil is referred to as a “deflocculated soil,” which results in an “unstable” soil condition.

In this case, the soil particles appear like powdered wheat flour, since the individual soil particles are not allowed to form larger solids. Therefore, the soils particles remain in their smallest sizes, since they are not allowed to form even small aggregates.

This resultant consequences occur on soils first, and then on plants secondly. Soils with high sodium levels are usually incapable of soaking up water at the surface (poor infiltration). If and when it does, the soil tends to stay wet just at the surface, with poor soil oxygen content. Extremely shallow rooting occurs with turf and landscape plants. Unstable sodium affected soils are also highly prone to compaction, since the individual soil particles can be compressed together from external surface pressure (traffic and equipment). The end result is a decrease in the “air portion” of the soil, with the same amount or a slightly greater “water portion” left in the soil.

WARNING SIGNS OF A SODIUM THREAT

A water quality test has a parameter called the sodium adsorption ration (SAR). It is a measure of the potential sodium hazard that may affect soil properties. SAR is a relative comparison of the bad guy (sodium) to the good guys (calcium or magnesium – which has “small water bubbles which allow for

soil aggregation”). The important item here is “relative.” We want to have more calcium and magnesium than sodium, so the good guys outnumber the bad guys. This way there is more competition for soil attachment from calcium and magnesium, than by sodium.

SAR values of 0-5 are desirable, 5-10 are usually safe, 10-15 are a cause of concern on finer textual soils and SAR values of 18

average of sodium in the soil, which we want in this case, to be low.

If the ESP is 15 percent or more, most soils will have single particle displacement (deflocculated and unstable). On clay and silt type soils, the ESP should be 10 or less. On pure soils, high ESP values are less significant, once again because of the preponderance of large soil particles to begin with.

We want to have more calcium and magnesium than sodium, so the **good guys** outnumber the bad guys.

or more are usually a predictor of an up and coming sodium problem in soils which are sandy loams, or finer in texture. Pure sands can “handle” high SAR water, because the soil particles are naturally large to begin with, and sands have less surface sights to hold onto sodium. Remember that the total amount of calcium, magnesium and sodium salts does not influence the SAR, but the relative amounts do!

The true measure of sodium in the soil is determined from a soils lab test report. The soils test should have a component called the Exchangeable Sodium Percentage (or ESP). This is an estimate of the percentage of the soils to retain sodium, compared to all other elements which are positively charged (like sodium).

Therefore, ESP is calculated as the amount of sodium divided by the sum of the soil adsorbed sodium, calcium, potassium and magnesium. In essence, it is the batting

SOIL MAINTENANCE OF SODIUM EFFECTED SOILS

How can I change my soil to correct and prevent an unstable soil condition from a high sodium content soil? What needs to take place is a chemical substitution between the soil particle and the attached (adsorbed) sodium.

Luckily, sodium has only one positive charge (Na+), while calcium and magnesium have two (Ca++, Mg++). These “double-charged” particles have a stronger attraction to the soil particle, which has a negative outside charge to begin with. Remember, opposites attract each other. Therefore, any element with two charges will be favored over the element with just a single charge.

Along comes calcium. When calcium is added to the soil, we are adding a relatively inexpensive double-charged element. The calcium, in time, will trade hands with the

sodium and remove it from the outside of the soil particle, and allow it to wash away.

The type of calcium product and amounts required are important concepts. Calcium carbonate, also called Ag-limestone, is not soluble in soils which have a pH of 7.8 or above. Gypsum, (calcium sulfate) is way more soluble than Ag-limestone, and is the

most popular calcium source for soil sodium management in a high pH soil. Thankfully it's not that expensive. It takes several months for gypsum to slowly dissolve from rain and/or regular irrigation, but when it does, the calcium will "pull off" the sodium, which then gets washed away as sodium sulfate.

Other forms of calcium compounds are

expensive and can burn the turf or cause temporary soil drought problems. An example is calcium chloride. While the "calcium" is instantly available, the chloride can burn turf and cause temporary, but severe, water stress availability problems in the soil.

Gypsum needs to be applied on a regular basis, since sodium is most likely being added on a regular basis with the irrigation water. The amount of gypsum required to keep the soil ESP values at acceptable low levels depends on how high the ESP value is, and the capacity of the soil to hold positively charged particles. The letter is called the cation exchange capacity (CEC).

Sands have little CEC, loams are intermediate, while silts and clay-type soils have high CEC capacities. Soils with high organic matter contents (usually in the surface 2.0 inches) also have a high CEC capacity. The higher the CEC and the ESP, the more calcium (gypsum) you will need to lower the ESP to desirable levels. **GCI**

Gypsum Requirement

Exchangeable Sodium Percentage

Soil Texture	Exchangeable Sodium Percentage					
	10	15	20	30	40	50
lbs per 1000 sq. ft.						
Coarse	50	100	150	250	350	450
Medium	75	150	250	400	550	700
Fine	100	200	300	500	700	900

Amount of 90 percent pure gypsum to apply to reduce the Exchangeable Sodium Percentage (ESP) value to acceptable levels to restore soil aggregation based on soil type and ESP values from a soil test report.

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Terry Buchen, CGCS, MG, is president of Golf Agronomy International. He's a 41-year, life member of the GCSAA. He can be reached at 757-561-7777 or terrybuchen@earthlink.net.

Travels With Terry

Globetrotting consulting agronomist Terry Buchen visits many golf courses annually with his digital camera in hand. He shares helpful ideas relating to maintenance equipment from the golf course superintendents he visits – as well as a few ideas of his own – with timely photos and captions that explore the changing world of golf course management.



HOSE REEL TRAILER

At the Des Moines (Iowa) Golf & Country Club, director of grounds Rick Tegtmeier, CGCS, conceived the hose reel trailer idea for hand watering and syringing greens at his tenure as superintendent at his former golf course. 1½" square tubing was used to build the tongue and trailer framework. A Northern Tool model 135012 ATV tire, wheel, axle and hub kit; model 12600 21" tie high-impact fenders; and 1⅝" stainless-steel hitch were used. The 15'-long, 1"-di-

ameter hose to connect to the quick coupler was acquired locally. A Cox Hose Reel model 1175-6-100-BXCX was purchased from the manufacturer and the 100 feet of 1"-diameter hose and nozzle was acquired from Lesco. The material costs were \$875 each for the three total trailers built, which took about 20 hours each to build. There is also a 12-volt battery operated hose reel available from Cox Hose Reels.



THE CLAW

Scott Dickson, superintendent, and Bud Wunder, head mechanic, at the Saddle Creek Resort in Copperopolis, Calif., conceived the idea for "The Claw" attachment for the John Deere backhoe to help remove cattails, water primrose and other aquatic weeds more efficiently from numerous lakes and ponds. Eight used Toro model 3500 and 4500 rotary blades were used for the linkage points and another 18 were used for "The Claw" attachment. The frame was built using 15" x 15" long, ⅜" x 2" angle iron and 2" x 4" x ⅛" thick rectangular tubing was used to build the boom. The backhoe extends 12" and "The Claw" boom extends 21', it is attached by two pins and two bolts and it takes less than five minutes to mount or dismount. The materials cost about \$30 for items not already in inventory and it took about 30 hours of trial and error to build. **GCI**



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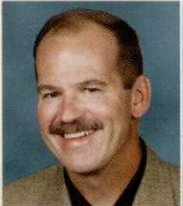
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RUN, WELDON, RUN

In many ways, Weldon Davis is a typical golf course superintendent.

He wakes up at an ungodly hour to head to The Creek GC in Spartanburg, S.C. He's dealing with the lingering aftereffects of a very crappy winter. "We were frozen solid for three or four weeks in February and we had a late frost, so we've been on pins and needles a little bit waiting to see how things respond." He's considering converting the putting surfaces over to Diamond zoysia and has been bending Dr. Milt Engelke's ear about the variety, which is still kind of a novelty on greens. On weekends, he's a NASCAR nut who used to race his own cars.

Yup, Davis is a pretty typical superintendent except for one thing: he's running for a state senate seat. "Three years ago, I never thought I'd be doing it," he says. "I'm just sick and tired of the people in Columbia and D.C. They represent themselves and the special interests, not the people."

Davis wants to serve his neighbors in the 33rd district – mainly the Spartanburg metropolitan area – in the state capitol. This is his second attempt. Two years ago, he ran sort of a practice campaign against a 10-term incumbent Republican. He used his own money, knew he didn't have a chance and even (gasp!) ran as a Democrat because that's the way the local powers-that-be wanted it. "I knew I couldn't win, but I wanted to learn about the process by doing it."

Now, the incumbent is retiring and Davis is gearing up for the primary election in June with a decent shot at being elected. An early online poll has him well ahead, but he's worried that his opponent will outspend him and bury him with dollars from companies and lobbyists.

Why doesn't Davis fight fire with fire? "I'm not taking money from lobbyists. It's been offered, but I said, 'No

thank you, sir.' When big money gets into small political races, they're going to want something sooner or later. That's what I'm running against, so why would I do it just to get elected?" Jeez, that sounds like common sense. Is that allowed in politics these days?

Davis isn't new to government. He's served on the local foster care review board and been active in party stuff for years. He's a Spartanburg guy and he knows the right folks around town. Mostly, he's a passionate person who's fed up with politics as usual.

His agenda is conservative, but not over the top. He hates waste and wants smaller government and tax reform. His experience on the foster care board has alarmed him about the quality of child health care

on welfare or lives in public housing in the state. The idea has been a sensation locally, around the state and – thanks to media coverage – nationally.

Hmmm, more common sense. Did he not read the politician's handbook?

Despite the fact that I was intrigued by the idea of a candidate with uncommon common sense, I really wanted to ask Davis one question: How in the hell does a golf course superintendent find time to run for state office? "It's just like being a superintendent – it takes dedication," he says with more modesty than can be imagined. "I get off work, I make calls and I knock on doors. I love talking to people about the issues."

Will he make "our" agenda part of his work at the statehouse? "Of course

It's sad that what's common in our world is far too uncommon in government. I hope Davis can begin to change that.

and welfare costs. His experience in golf has made him a committed but realistic environmentalist. And, like many, he wants a chance to fight for better jobs and better education in his hometown.

But, two of Davis' positions have gained him the most attention and support in his district. First, he advocates going back to the days of making prisoners do a decent day's labor: "We should put inmates back to work on the highways. We can save money, have better roads and help them get used to working. Frankly, they're more likely to be successful in getting a job and going to work after prison if they're used to working eight hours a day like the rest of the world."

Second, he proposes to institute random drug testing for anyone who's

I will. I'll promote the economic impact of golf in the state and the benefits of turf. It'll be great to have someone from our business letting people know about how much we benefit the community."

After talking with Davis, I tried to remember if another superintendent had even run for statewide office. To my knowledge, none has. That's a shame. We're a profession of hard-working, careful, thrifty problem solvers who value clean water, healthy recreation and a good economy. It's sad that what's common in our world is far too uncommon in government. I hope Davis can begin to change that. **GCI**

Davis' Web site is: www.weldondavis.org. Donations or well wishes from colleagues are welcome.

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