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(turfgrass talk)

Managing salt by leaching

It is important to know how much salt is in your irrigation water. Salt dissolved in irrigation water is invisible. But add too much of the invisible salt through irrigation, and the damage to the turf can be quite visible.

How can one prevent problems caused by salt accumulation? The solution is to add more water than the soil can hold. It doesn't sound like adding even more salt and water will help, but it does. Here's how it works.

When the soil cannot hold the water, the water will move down below the root zone. This is called *leaching*. When the water leaches below the root zone, some salt will be dissolved in the water, and the water will carry the salt away as it leaches.

One needs to know three numbers in order to determine how much water to apply to generate the right amount of leaching. First, one needs to know how much salt is in the water. This will be expressed as the electrical conductivity of the water (EC_w) in units of decisiemens per meter (dS/m). If the water salinity is expressed as total dissolved solids (TDS) in parts per million (ppm), the salinity in TDS units can be converted to EC_w units by dividing the TDS ppm by 640.

The second number one needs to know is the salinity that can be tolerated by the grass in the soil. The soil salinity is also measured as EC, but the soil salinity is expressed as EC_e, with the subscript *e* meaning soil extract. As a starting point, I would try to keep EC_e from exceeding 3 dS/m for Kentucky bluegrass; 5 dS/m for creeping bentgrass, perennial ryegrass and tall fescue; and 8 dS/m for bermudagrass, seashore paspalum and zoysiagrass. We will not actually measure the soil salinity in order to predict how much water to apply for leaching. We just need to know the EC_e level that the grass can tolerate.

Once we have the EC_w of the water to be used for irrigation, and the EC_e of the grass that will be irrigated, the leaching requirement (LR) can be calculated. The equation to determine LR is:

$$LR = \frac{EC_w}{5(EC_e)-EC_w} .$$

One more number is required before getting the amount to apply for leaching. That is the amount of water the grass uses, which is estimated by the evapotranspiration (ET) in millimeters. The quantity of water to apply to keep the soil from exceeding the threshold EC_e is:

$$\frac{ET}{1-LR} .$$

As an example, let's say we have Kentucky bluegrass, for which we will use an EC_e of 3 dS/m; the irrigation water has an EC_w of 2 dS/m. The LR will be:

$$\frac{2}{5(3)-2} = 0.15 .$$

If the ET were 5 mm, then the quantity of water to apply to keep the soil from exceeding 3 dS/m would be:

$$\frac{5}{1-0.15} = 5.9 \text{ mm} .$$

As you can see, this 5.9 mm is more water than the grass is expected to use, which is 5 mm. That extra water will leach below the root zone, carrying some salt with it. Because leaching is required to manage salts added through irrigation water, it is evident that good drainage is required when irrigation water contains salt that must be removed through leaching.

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