Hurricane Preparedness for Turf Managers

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What problems will turfgrasses face due to the impacts of a natural disaster such as a hurricane or tropical storm? The prospect of hurricanes hitting the Mid-Atlantic seem to escalate in the fall and far too often our Tidewater residents in particular have to prepare (and deal) with the fiercest weather phenomenon on the planet.

There are detailed instructions in overall Emergency Preparedness from the National Weather Service, which can be accessed at http://www.nhc.noaa.gov/prepare/ready.php and http://www.ready.gov/hurricanes. This information is obviously far more critical than what I present here because this involves preparedness and safety from the standpoint of life, limb, and property. Other links that may be useful include the National Weather Service's National Hurricane Center - http://www.nhc.noaa.gov/ - or - http://www.nws.noaa.gov/om/hurricane/index.shtml.
However, I will use this update to specifically focus on the concerns to turfgrass systems from anticipated hurricane or tropical storm impacts.

The primary concern to turf is salt intrusion, whether it is delivered directly to the soil by tidal surges, or is accumulated in irrigation ponds for future applications to the turf and landscape. Salts in the soil affect turfgrasses in three ways:

1) Physiological drought. The salt levels are so high in the soil solution that water uptake is prevented by osmotic inhibition (i.e., even in the presence of water, there is no water uptake by roots because salt concentrations are so high in the soil.) Physiological drought is not uncommon from excessive fertilizer applications and is one reason that many soil tests include measurements for soluble salts in their testing procedures.
2) Potential toxicity from certain ions in the saline media that may either directly affect the plant or cause an imbalance in the uptake of other nutrients
3) A combination of the above.

Bermudagrass, zoysiagrass, creeping bentgrass, and St. Augustinegrass all have excellent salinity tolerance; tall fescue and perennial ryegrass have moderate salinity tolerance, and fine fescue and Kentucky bluegrass have relatively poor salinity tolerance. Soil salt levels are determined by measuring Electrical Conductivity (ECe), where higher values (reported in units of dS m-1) mean higher salt concentrations. Growth of most turfgrasses is not affected by salt levels up to 2-3 dS m-1. These values near the soil surface are possible following applications of many water soluble fertilizers used on turf. A thorough irrigation event with potable water is usually sufficient to adequately dilute these concentrations. At levels of 3-6 dS m-1, the least tolerant grasses begin to show signs of stress. By 6-10 dS m-1, the growth of most turfgrasses frequently grown in the Mid-Atlantic begins to be affected by the salt levels in the soil.

Salt levels must also be considered with sodium (Na) concentrations as well. Mid-Atlantic soils generally do not have problems with Na, so this problem is usually only going to be of concern

in conjunction with salt accumulation due to tidal surges and seawater intrusion. Additional tests such as a Sodium Adsorption Ratio [a term reflecting the relative proportion of Na to calcium (Ca) and magnesium (Mg)] and pH determination are often conducted in conjunction with ECe. Na by itself is not a potential toxin to turfgrasses, but at sufficient (and persistent) concentrations its deleterious effects on soil structure and water infiltration/percolation are of concern.

What should we pay most attention to? The major concerns will likely be due to accumulation of debris or undesirable soil material on the turf surface from flooding rather than the effects of the seawater. These materials should be removed as quickly as possible in order to restore the grasses' photosynthetic capacity. Removing silt and clay that is deposited by flooding is a painstaking process, but one that is essential to prevent contamination of existing soils (particularly modified, sand-based soils). Aerating these soils is another important activity to restore soil oxygen levels that promote healthy root and microbial activity. One positive piece of news regarding turf recovery is that with the amounts of rainfall that the Mid-Atlantic receives annually, the effects of tidal surges on soil salinity and sodic properties is usually minimal and short duration. Turfgrasses are some of the most forgiving plants in the landscape, and though there might be some yellowing and slowing of growth associated with temporarily high salt levels, the grasses rebound quickly following flushing of the soil with potable irrigation or a rainfall event. For those rare times when salt/Na levels persist, gypsum (calcium sulfate) can be applied according to soil test results. For a really thorough discussion on dealing with Na and other issues associated with a hurricane, take a look at "Promoting Turf Recovery Following a Hurricane" at http://disaster.ifas.ufl.edu/PDFS/CHAP06/D06-20.PDF . While developed primarily for golf turf, the strategies apply to just about any turfgrass situation.

Probably the biggest concern with salt water will be its potential accumulation into irrigation holding ponds, etc. from storm surges. Repeated irrigation with water containing more than 1200 ppm soluble salts will begin to show early signs of stress (yellowing, reduced growth rate, etc.) within 5-7 days of use. Again, the saving grace is that a 1/4 to ½ inch rainfall event can flush away most of the soluble salts in the soil IF it occurs soon enough. The Turf Recovery publication suggests pumping out contaminated irrigation lakes and refilling with fresh water where possible. It is hopeful that salt concentrations might be sufficiently diluted by rainfall events, but this is something to consider for long-term irrigation programs.

Another question related to storm damage is the duration that turfgrasses can withstand submersion from flooding. There has not been a lot of research done on this problem, but what has been completed indicates that most turfgrasses are remarkably resilient in surviving submersion. Factors such as water temperature (cooler water causes less damage) and water movement (moving water is less damaging) are important, as well as the turfgrass species. For instance, work in Louisiana by Dr. Jack Fry (now at Kansas State University) in the late 1980s indicated bermudagrass, zoysiagrass, and centipedegrass could survive up to 55 days of submersion. Similar work with cool-season turfgrasses reported surprising tolerance to several days of water submersion. If plants are not completely submerged (i.e. leaf tips are exposed to the air), survival chances are even greater.

Specific recommendations in preparation for an approaching storm? Golf superintendents that live in coastal regions are much better versed in this than I, and they already know the ins

and outs of having additional equipment, generators, etc. on hand, as well as making special considerations for their maintenance facilities, fueling facilities, and chemical storage rooms. The derecho of the summer of 2012 reminded us of the importance of alternative power sources in running irrigation pumps. In the face of almost certain significant impacts of these storms, some common sense should be applied regarding fertilizer, chemical, and seeding applications. With the prospect of inches of rain soon to arrive, what sense does it make to apply fertilizers and pesticides just before it hits? In this case, ignore the calendar and your schedule and do what is right in terms of delaying the chemical application. It will be a waste of time and money, and is environmentally irresponsible.

However, I think there is one supplemental chemical approach that fits very well with an application a few days prior to an approaching storm if it is applied in a timely manner where the plant can maximize its effects: a plant growth regulator (PGR) such as trinexapac ethyl. This is a product that many golf and sports turf managers are already using in their regular management programs anyway, and ensuring that your turf's growth is regulated prior to storm arrival can make a big difference in restoring it to optimal quality after the storm passes. Many of my deep south turfgrass management friends have indicated on a very regular basis that perhaps the most significant (and beneficial) strategy they made in prepping for an advancing hurricane or tropical storm was to ensure they had a plant growth regulator application in place prior to an approaching storm. This may or may not be necessary on warm-season grasses in the fall in the transition zone since they have rapidly declined in growth rate from the cooling temperatures, but it might be an effective strategy on perennial cool-season stands or overseeded bermudagrass turfs to ensure that one is not baling hay when the soil finally dries enough for mowing. And of course, if no PGR can be applied, it makes sense to mow the grass before the storm hits IF you can justify the time to cut turf with all the other hurricane preparedness activities you might face.

Here's hoping that all impacted will come through the storm season relatively unscathed.