2011 Drought Stress Problems

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Introduction:

Information provided in this document is to help agents provide information to their clients about problems being caused by this record setting heat and drought condition that is occurring in Texas. It primarily deals with turfgrass irrigation as well as factors influencing turfgrass irrigation during these excessive conditions. It also discusses a couple of turfgrass problems that are often mistaken for drought stressed conditions in turfgrass.

According to a recent article in AgriLife Today, 99% of Texas is in some type of drought condition and 75% of the state is in exceptional drought conditions. These drought conditions along with record breaking temperatures have placed a tremendous stress on water supplies throughout the state. Most areas of the state have initiated some type of water restrictions for irrigation of turfgrass sites such as lawns, golf courses and sports fields and in some cases, the outside use of water for turfgrass/landscapes areas has been completely banned. With no relief in sight, the situation is only going to get worse.

It is more important than ever to make sure our water supply is being used as efficiently as possible when applying supplemental irrigation to lawns, sports fields, golf courses and other turfgrass sites. Listed below are some of the factors that impact efficient use of water on turfgrass/landscape sites.

Irrigation System:

Make sure irrigation system is running as efficiently as possible. Conduct an irrigation audit on the irrigation system. An audit will identify any problems with the irrigation system such as leaking heads, heads not rotating, mis-aligned heads and too low or too high pressure. All these problems will dramatically affect how efficiently supplemental water is being applied. Fix any problems observed during the audit. Secondly, the audit will provide precipitation rate (in./hr.) and distribution uniformity (%). Using this information plus soil type and ET (evapotranspiration rates), you can then determine number of irrigations per week and how many minutes to run each irrigation zone. Note, if there were any major problems with the irrigation system, fix the problems and then run the audit a second time to get more accurate run times and frequency of irrigation.

If homeowner can't find a professional irrigation company to do the audit, then they can run their own audit using either straight edged cans such as tuna cans or dog food cans. Also, you can purchase the new aggie catch cans from the Texas AgriLife Extension Library for irrigation auditing. To find aggie catch cans, go to Texas AgriLIfe Extension Service Bookstore, and then click on lawn/landscape and then click on SP-424. Listed below are the steps for using the Aggie catch cans to run an audit on your irrigation system.

1. Place catch cans in-between heads in one zone. Number of catch cans between heads will be determined by distance (feet) between heads. Generally 2 to 3 catch cans between heads is sufficient.
2. Run each irrigation zone for set period of time such as 15 minutes. Then record amount of water in each can and then determine average amount per can.
3. Multiplying this value by 4 (4 X 15 = 60 minutes) will provide inches per hour. This will tell you how long you need to run the system to obtain the desired amount of water.

If using the straight edged cans, the process is the same as using the catch cans. The only difference is you will have to use a ruler to measure the depth of water in each can to determine inches of water applied in the 15 minute time frame.

Knowing distribution uniformity is also important. To calculate distribution uniformity, take the lowest recordings for ¼ of the containers and calculate an average for these cans. Next, take all the recordings and add them up and determine the average for the total number of containers. Next, divide the lowest quarter average by the total average and this will provide the distribution uniformity value (%). Generally, I find that the distribution uniformity is around 50 to 60% on many of the irrigation systems I audit. However, it is important to calculate this value for each zone and not just use an estimate.

If irrigation zone was applying approximately 1.0 inch per hour and you need 1.5 inches of water per week, then you will need to run the zone for 1.5 hours (90 minutes) each week that significant rainfall doesn't occur. Note, if the distribution uniformity was 60%, then you need to divide the 1.5 hours by 0.6 (60%) to get the correct amount of water needed. If you divide 1.5

hours by 0.6 this means you really need to run the zone for 2.5 hours (150 minutes) per week. This illustrates why it is so important to make sure the irrigation system is applying water as efficiently as possible. Ideally, you would apply this amount of water in one or two applications per week. Note, if city has imposed water restrictions, then homeowner may be able to only water their lawns once per week. Generally, in 1.5 hours you are going to apply more water than the soil can take in and there will be a considerable amount of run-off, which is wasting water. Also, if you have a large number of zones, there will not be enough time to run all the zones for the needed amount of time.

Figure 1. Using cat foot cans to audit irrigation system in home lawn.

Figure 2. Aggie catch can used for audits.

Factors Affecting Run Times:

One of the hardest things to tell a homeowner is how long to run their irrigation system to get the right amount of water. In truth, without knowing the precipitation rate and distribution uniformity for the irrigations system, soil type, grass and other factors such as shade and slopes, it is impossible to provide an accurate number for the homeowner. Listed below are some factors that will affect irrigation frequency and amount of water per irrigation.

When conducting an irrigation audit, the auditor will determine soil type (sand, clay, loam, etc.) and affective root depth. Knowing soil type will determine how long you can go between irrigations before the turfgrass becomes stressed. Clay soils can hold more available moisture in the ground and so they do not need to be irrigated as often as sandy soils which cannot hold nearly as much available moisture in the soil. Effective root depth provides information on how long to water. Where possible, apply enough water to reach depth of root system in the soil. Roots cannot use water applied past the effective rootzone and this water will be wasted. On the other hand, shallow irrigation significantly less than the effective rootzone can lead to reduction in effective root depth and will require more frequent irrigations to prevent drought stress conditions.

A large amount of water applied to lawns/landscapes is wasted due to surface run-off. One of the main reasons for surface run-off of applied irrigation water is irrigation system applying the water faster than the soil can take in the water. On clay soils, the infiltration rate is often below .2 inches per hour and most irrigation systems are applying water at rates as high as 1.0 inch per hour. Other factors that can contribute to run-off include soil compaction, thatch layers, slopes and shallow soils. Listed below are ways to reduce surface run-off of applied irrigation water.

1. Use several cycles to apply water to each zone. This is known as cycle and soak method and there are now irrigation controllers which have these cycle and soak cycles. Basically, once run-off occurs, turn zone off and go to rest of the zones and then come back and run zones again. This means you will have to observe each zone to determine how long it takes before run-off occurs. This will be different from zone to zone depending on slope, compaction, thatch layer, exposure, etc.
2. Instead of applying water once per week, break up water requirements into 2 to 3 applications. Note, if water restrictions have been applied, this generally means you can only apply water once per week. In that case, using the cycle and soak method becomes more important.
3. Aerify soils that are compacted. However, do not aerify a lawn that is going through the heat/drought stress we are currently experiencing. Aerification should be conducted in spring and early summer months when hopefully we have better soil moisture conditions.
4. If thatch is present, remove thatch layer. Again, this process should not be conducted under our current weather conditions, but should be done in early spring to early summer months.

5. Slopes are one of the hardest areas to get enough water down into the soil profile before run-off occurs. The cycle and soak method will help. Using a soaker hose on slopes instead of automatic system works well, but most people aren't willing to take the time. Also, there are some good soil wetting agents that will aid in moving water down into the soil profile. Not sure how available these are to average homeowner, but professional lawncare/landscape companies should know where to find them.
6. A significant amount of water is lost because water is landing on hard surfaces such as sidewalks, driveways and streets. Adjust irrigations heads so they are applying water only to turfgrass areas. Note, this is hard to do, especially in areas of state where wind is a problem.

Using ET_o (Evapotranspiration) Rates:

Evapotranspiration is a calculated number used to determine the total loss of water from a landscape through evaporation (soil surface) and transpiration (through plants). When calculating how much water is needed for turfgrasses during the year, ET rates should be used to determine this value. For warm season turfgrasses such as bermudagrass, St. Augustinegrass, zoysiagrass, centipedegrass and buffalograss, research has shown you need to apply approximately 60% of the ET rate for healthy growth. This value is referred to as the crop coefficient number. For cool season turfgrasses such as bluegrass and tall fescue, the crop coefficient is 80%. Note, many of the new irrigation controllers use ET data to determine when the system should run and how long. These are commonly referred to as smart controllers.

As an example, the ET_o rate for the last 7 days at the Dallas Center was 2.48 inches and there was no rainfall. Therefore, if you multiply 2.48 (total loss of water) times 0.6 (crop coefficient for warm season grasses), you get 1.488 or approximately 1.5 inches of water needed to maintain healthy growth. It needs to be noted that this 1.5 inches does not include distribution uniformity for the irrigation system. If you have low distribution uniformity values, most likely you will have hot spots show up in the lawn if you only apply 1.5 inches for the week. Instead of running the entire system longer, hand water these hot spots or use soaker hose in these areas. I realize this is unrealistic for many homeowners, but if we are going to significantly reduce water use on landscapes, these type of measures need to be considered.

Turfgrass Selection:

Buffalograss is one of the most drought tolerant turfgrass we have for use in home lawns at this time. Also, bermudagrass and some of the zoysiagrasses have good to excellent drought tolerance. As a rule St. Augustinegrass and Centipedegrass are going to have less drought tolerance than the bermudagrasses, zoysiagrasses and especially buffalograss. However, these grasses do have better drought tolerance than most people give them credit and this is especially true for Floratam St. Augustinegrass. If a homeowner is considering replacing their lawn or they are planting a new lawn, then they need to take into consideration the differences in drought tolerance. However, other considerations should be adaptability of the different grasses. For example, buffalograss doesn't do well in moderate to heavy shade, sandy soils, acidic soils or salty soils. So, while buffalograss is the best drought tolerant turfgrass, it is not adapted to all areas of the state and if planted in an area it is not adapted, it will perform poorly.

Starting in 2006, Texas AgriLIfe Extension faculty in Soil and Crop Science Department and Agricultural Engineering conducted a two year drought study in San Antonio, Texas. This project was supported by San Antonio Water Systems and the Turfgrass Producers of Texas. Basically, the research included 25 different grasses (bufalograss, bermudagrass, St. Augustinegrass, and Zoysiagrass). These 25 grasses were planted in one set of plots with a 4 inch soil depth and then a second set was planted in native soil. In 2006 water was turned off for 60 days and then amount of recovery was recorded for the next 60 days. Same thing was done again in 2007 with a new set of plots. Note, plots were covered with a rainout shelter if rain occurred during the 60 day drought simulation period.

In both years, none of the 25 different grasses growing in the 4 inch soil profile survived the 60 day drought, while the 25 different grasses growing in the native soil all eventually recovered in both years. Generally, grasses such as buffalograss and most of the bermudagrasses recovered the quickest following the 60 day drought period. While there was a lot more information gathered from this study, the fact that all grasses died at 4 inch profile both years and that all grasses eventually recovered in native soil is very important information. Basically, this tells us that if we have a warm season grass growing in native soil with at least 6 to 8 inch soil profile, it can survive a 60 day period without supplemental application of water. Note, the native soil at this site was a clay type soil and if same study was conducted on a sandy soil profile, results would be different.

Cultural Practices in Drought Conditions:

1. Fertilization – during drought conditions reduce the amount of fertilizer being applied, especially nitrogen. If water is turned-off due to water restrictions, then do not apply any fertilizer. It is important to have soils tested to make sure plants are receiving proper amount of all nutrients, especially potassium.
2. Mowing – raise mowing height during drought conditions. However, stay within the recommended mowing height range for the different turfgrasses. Do not mow the grass when it is in drought stress. This can cause burn of the turfgrass plants,(See picture 3). If water is turned-off, stop mowing the turfgrass.
3. Aerification – discontinue aerification during drought conditions.

Picture 3. Wheel tracks from mowing when grass is under moisture stress.

Recognizing Moisture Stress vs. Other Problems:

It is important to be able to distinguish drought stress problems in turfgrass versus an insect and/or disease problem. While turfgrasss disease and insect problems are not usually a problem in these situations, there are some insect/disease problems that could cause significant damage if not corrected.

Turfgrasses turn a bluish to grayish color (see picture 4) when they reach the permanent wilting point and then shortly after this they will turn brown. This bluish to grayish color is a classic symptom for severe moisture stress in turfgrasses and it is often mistaken as a disease problem. Treating with a fungicide will not correct the problem.

Figure 4. Classic discoloration associated with severe moisture stress in turfgrasses.

Figure 5. Drought stress symptoms in hybrid bermudagrass lawn.

Figure 6. Browning of bermudagrass due to poor coverage from irrigation system. Not providing head to head coverage.

Figure 7. Really poor coverage. Enough said.

Potential Disease Problems:

The main disease problem a observe in these kind of years is Nigrospora Stolon Rot in St. Augustinegrass lawns. This is a disease that requires high temperatures for development of the disease, so you don't normally see it in years of adequate moisture or where irrigation can be applied. It should be noted that high temperatures are also associated with the disease and not just drought conditions. I have actually seen several lawns already this year with the Nigrospora Stolon Rot and in each case it had been identified as drought problems. Unfortunately, there are no listed controls for this disease problem. When first discovered in 1980, we had good luck with Daconil (Chlorothalonil), but since then the chlorothalonil has been banned for application to turfgrasses in home lawns. Note, you can still use chlorothalonil on turfgrasses in commercial lawns, sports fields and golf courses. Below are several pictures of what the Nigrospora Stolon Rot looks like. The lesions girdling the stolons is one of the key symptoms to look for. While there are other diseases which can cause lesions on the stolons, such as gray leaf spot, the gray leaf spot is most likely not going to be active in these conditions.

Figure 8. St. Augustinegrass lawn with Nigrospora Stolon Rot. Originally diagnosed as drought damage.

Picture 9. Lesion on St. Augustinegrass stolon cause by the Nigrospora Stolon Rot fungus. Eventually the fungus will kill the plant from this point on out to end of the stolong.

Insect Problems:

Main insect to be aware of at this time of the year is the chinch bug. While this is not a major problem in all areas of the state, it can be quite active in certain regions of the state. Chinch bugs like to feed on lush turfgrass that is growing in hot weather conditions. Again, chinch bug damage is often initially mistaken for drought damage or in some cases, drought damage is mis-diagnosed as chinch bug injury. If there are enough chinch bugs present to cause damage to the turfgrass, you can usually spot them without too much trouble. If not sure, you can use the flotation method to try and find the chinch bugs. This entails sinking a can (coffee can with both ends cut out works well) into the soil and then fill it with water. If there are chinch bugs present, they will float to the top of the water. Generally, it takes approximately 25 chinch bugs per square foot to cause damage.

Below are several pictures associated with chinch bug activity and damage.

Figure 10. Instar stage on left is stage that does most of the damage. Adult, far left does very little feeding on the turfgrass.

Figure 11. St. Augustinegrass lawn damaged by chinch bugs.

Figure 12. Dead turfgrass is St. Augustinegrass killed by chinch bugs while green areas is bermudagrass. While chinch bugs will attack bermudagrass, it is not very common.

Summary, Water Conservation in Drought Conditions:

1. Audit irrigation system to make sure it is working as efficiently as possible.
2. Use cycle and soak method to help prevent run-off from occurring.
3. Don't water during daytime high temperatures. Note, most water restrictions require nighttime watering.
4. Use soaker hose or hand watering to water slopes.
5. Reduce fertilization, especially nitrogen during drought conditions.
6. Monitor turfgrass for any insect and/or disease problems.

Final note, just because turfgrass turns brown does not mean it is dead. Initial browning of turfgrass is loss of leaf tissue primarily. Watering the site occasionally to keep crown area of plant moist will allow plants to survive extended drought period. Unfortunately, it is difficult to find data that shows how often to water turfgrass just to keep it alive and how much water to apply. Generally, 0.5 to 0.75 inches of water every 3 to 4 weeks will keep grasses alive in clay soils and 0.5 inches every 2 to 3 weeks should keep grasses alive in the sandy soils. This is strictly based on my observations and not on research data. However, remember that in the San Antonio study, all grasses growing in native soil (clay type) survived without water for 60 days.