MANAGING TURFS AFTER EXTENSIVE RAINFALL

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In Michigan we seldom experience the extremely heavy rainfall which occurred during the fall of 1986. Some areas of central Michigan received at least 14 inches in one week, most of which fell in a 3 day period. Accompanying this intensive rainfall was an extensive period of warm rainy weather. Local weather records indicate measureable precipitation occurred 25 days out of 30 during late September and early October. Such weather conditions can have many detrimental effects on both turf and soil. And with the extremely high rainfall came both natural flooding and the failure of several dams which resulted in additional flooding, siltation and erosion problems on turf sites adjacent to rivers.

There are several detrimental effects on turf caused by these conditions in the fall of 1986. These effects occurred on both turf and soil to varying degrees depending on regional and local conditions. For some turf managers the effects were more an inconvenience and the turf recovered reasonably well. On the other end of the extreme, however, some turf areas adjacent to rivers lost all their turf on the site. The various problems which were caused by the weather will be addressed below. Following that will be a series of suggestions for practices to consider for turf recovery.

1) Excessive growth and succulence of turf. During the fall day length decreases and both day and night temperatures are reduced. The cool season turfgrasses which we manage in Michigan respond to these conditions by utilizing more of the carbohydrates from photosynthesis in increasing turf density and extending the root system. This is a very important time of year during which the turf normally recovers from the stresses of summer if proper management practices are followed. In 1986 fall temperatures were warmer than normal and with the extended period of cloudy wet weather more top growth occurred than would normally be expected. Because of the wet turf and saturated soil conditions normal mowing could not be practiced. Many turf sites were not mowed for 2 or 3 weeks, some even longer. When the turf was mowed severe shock occurred because of the extensive top growth which had occurred. This not only shocked the plant but left piles of clippings on the turf causing shading and further stress on the turf. Because of that rapid growth the turf was succulent and spindly and cell walls were very thin. Wear effects from mowing were often severe. In a few cases sod pieces were torn out of the turf by the mowing equipment. Several passes with the mower were helpful in some cases to break up the clumps of clippings. This caused further wear and compaction.

2) Increased disease activity. Weather conditions were ideal for dollarspot activity. Because of the continuously wet conditions many turf managers were unable to spray for control of dollarspot at appropriate times.

3) Weakened root system. Soils on many sites remained saturated during much of the wet period. This resulted in a weakened root system due

to the lack of aeration in the soil. This occurred during the time we normally expect root systems to recover from losses which occur during summer heat stress.

4) Loss of turf density. We expect turf density to improve in September and October through increased tillering or rhizome or stolon growth. With so much energy going to succulent top growth and the resultant shading effect, turf density did not improve and was actually reduced on some sites because of the mowing problems.

5) General lack of hardiness. Being very succulent the turf became very susceptible to stress, particularly wear caused by traffic. Fortunately, there was a return to more normal weather in late October and early November with a decided improvement in hardiness of the turf before winter.

6) Leaching of available nutrients. Excessive rainfall leaches nitrate nitrogen as the water drains through the soil. The soil has no means of holding the nitrate. Once it has moved beyond the root zone, it is no longer available to the plant. Under saturated soil conditions and relatively warm soil temperatures there is also the potential for denitrification losses which go into the atmosphere. With the wet weather the turf was not noticeably affected by the loss of nitrate over the short term as growth was even excessive. But ultimately that nitrogen will need to be replaced. Leaching of other nutrients is also likely. Of greatest concern to turf managers is potassium, particularly on sandy soils. The sands have very little cation exchange capacity to hold the potassium cation. Potash is needed to encourage improvement in turf density, root growth, general hardiness and wear tolerance.

7) Soil compaction and formation of ruts. Traffic always causes some soil compaction. When the soil is relatively dry the amount of compaction from normal equipment operation is minimal. But when the soil is wet the water films around the soil particles serve as a lubricant. Pressure caused by traffic allows soil particles to be pressed together causing compaction. This results in loss of the large soil pores necessary for drainage, aeration and easy root penetration. Under saturated conditions soil displacement can occur leaving rough surfaces which are unacceptable for mowing and for maintaining acceptable quality playing surfaces. Footprints on football fields which result from play when the soil is saturated not only affect management of the field but can cause significant injury to athletes.

8) Siltation from flooding rivers. Some golf courses and park sites were flooded extensively. In some cases the river deposited a layer of silty material on the turf. If the water was moving fairly fast, coarser material (more sandy in nature) was deposited. This usually occurs closer to the river and may be more fine sands and coarse silt material. On these sites such deposition has surely occurred previously and although reestablishment of the turf may be necessary, the deposition is usually coarse enough that the long term soil properties are not seriously affected. Farther from the river the material deposited will be fine silts and clays. This layer can form a seal through which air and water do not move readily. Turf under this layer will likely die if action is not taken soon after

deposition to break through that layer. Unfortunately, such sites stay wet so long because of their low-lying nature that there is not opportunity to move equipment onto the turf without other serious consequences, such as rutting. At one site a tractor used to push off some of the silty material slid off the slippery surface layer into a pond! Under the silty sealing layer there was loss of both existing turf and any seeds which could potentially germinate. So a golf course superintendent could not necessarily count on annual bluegrass seeds in the soil providing a subsequent turf by germinating after core cultivation, for example. Whether any such seed survived depends on how long the surface was sealed off to aeration by the silted layer and soil temperature. On some sites this fall there was adequate germination to negate the need for overseeding.

A further problem on golf courses was the siltation of sand bunkers. The layer of silt deposited could be mixed with the sand as a short term solution but over the long term replacement of the sand will be necessary, further adding to the cost of the flooding effects.

9) Erosion of turf areas adjacent to rivers. A few turf sites had sufficient water flow to cause erosion difficulties. The forces of the river caused sod to be torn out and deposited material in other places. This resulted in changing the shape of the landscape. Reshaping and reestablishment will be necessary on those few sites subjected to such significant erosion.

10) Loss of income. Many sod growers could not get on their sod fields to harvest sod for several weeks depending on local conditions. And landscapers could not prepare sites for sodding and seeding operations. This had a significant effect on income for both industries. Unfortunately, some soil preparation and establishment was done under very wet soil conditions which surely resulted in compaction. There is significant potential for poor rooting and susceptibility to stress and patch disease on such sites.

Most golf courses were forced to close several days because of wet soil conditions. Those subjected to flooding were closed for longer periods of time to allow for cleaning up after the flooding. Many did not open the remainder of the golfing season. A few golf courses find it necessary to reestablish turf on several to many holes. This will limit golfing until the reestablished areas are ready for play which could go well into the summer of 1987. Economically, this results in a significant loss of income. The loss of income from golf courses, sod farms and landscaping businesses will reduce the dollars available for purchase of equipment and supplies in 1987. And park areas and athletic fields may need reestablishment procedures where turf was lost due to the weather conditions.

Considering the various effects discussed above there are several suggestions which turf managers can consider depending on the particular problem(s) experienced on the turf. These practices will be separated into short term and long term approaches. The short term practices are for future consideration since these would need to be followed as soon after the moisture stress period as possible.

1) Pump water from the flooded area. If the water is impounded and equipment is available, pumping is an alternative to consider. The shorter the time water stands on turf the less likely any damage will occur. Also, the warmer the water the more likely injury will result. Of course, pumping is not feasible when water from the river can move back into the turf area through tile lines, etc.

2) Remove the silted layer from the turf. Removal of the majority of the silted layer is very important to turf recover. Highest priority should be placed on greens, tees and other high use areas. If the layer is thin and pumping equipment is operative, the use of water under high pressure is useful to flush the silty material off the turf. This should be a high priority for greens where soil layers can be very detrimental. In other places equipment could be used to push some of the material off the turf so leaves can be exposed for photosynthesis or crown tissue can regenerate new shoots. Of course, the silty material removed must be placed somewhere, either by creative reshaping of the site or by removal, perhaps at some later time.

3) Restrict traffic on the turf. While it is possible to restrict traffic on some sites by closing the golf course or park, other areas must be used regardless of field conditions. Football games will normally proceed unless the field is flooded or there is potential for serious injury to athletes. But if possible, refrain from any traffic while the soil is wet and susceptible to compaction, footprinting or rutting. This often becomes a very political decision, but one must consider the delicate balance between the short term use and enjoyment of the turf area compared to the long term detriment caused. One alternative to mowing is to allow the grass to grow until soil conditions dry, then mow the turf at a greater height to reduce stress on the plant. Gradually lower the mowing height to that desired. If clippings pile up excessively, repeated mowings may be helpful. Or the clippings can be removed by picking them up or blowing them off the site.

While this paper addresses some practices to consider after excessive rainfall and/or flooding have occurred it is suggested that care be taken in scheduling irrigation before planned heavy traffic events. For example, on football fields we would strongly advise that needed irrigation be applied one to three days before a game and that any such irrigation be light. Then if heavy rainfall occurs just before or during a game the soil is not already near saturation and the playing surface is much less likely to be damaged.

4) Treat curatively for disease if needed. With the expectation of return to normal weather, the opportunity to apply the appropriate fungicide would also be anticipated. But under continued warm, wet weather ideal for dollarspot one should make every attempt to treat chemically if possible. In the event of continued rainy weather the availability of light weight spraying equipment would be useful.

There are several longer term practices to consider depending on the particular condition which exists on a given turf site.

1) Apply nitrogen to encourage improvement in turf density. Timing of nitrogen application should be considered carefully. On general turfs the nitrogen can be applied in the fall as needed after rainfall has ceased and normal mowing schedules can be resumed. If the excessive rainfall has occurred at other times of the year the need for additional nitrogen must be determined on an individual basis. On golf turfs it may be best to wait until growth has ceased and use a late fall nitrogen application. Timing becomes a judgment call regarding the need to apply nitrogen in October. But with the excessive rainfall and loss of nitrogen experienced in the fall of 1986, the use of later fall nitrogen was especially useful. Time the application date to occur after growth has ceased. This usually occurs about November 5-10 in central Michigan. Adjust the timing to your area of the state and the weather conditions for that year. We have had excellent results from the use of nitrogen fertilizers which contain both slow and fast release nitrogen. The soluble portion is utilized by the turf in the fall while the slow release component is utilized gradually the next spring. Rate of application can vary from 1/2 to 1 pound nitrogen per 1000 square feet. After a particularly rainy fall it would be best to use the higher rate in order to replace some of the nitrogen lost.

It would also be wise to apply some additional potash after rains have ceased. Roots are still active until the ground freezes and the uptake of potassium can still occur. Use of a carrier which contains some potash with the late fall treatment is also suggested. The extra potassium may improve hardening off and tolerance of winter stresses.

It may be necessary to use additional nitrogen in the spring if the turf density is not at the desired level. This should definitely be considered if late fall nitrogen was not applied. Additional potash in the spring should also be considered.

2) Cultivation of the affected area. As soon as the soil dries somewhat it is wise to aerify or core cultivate the turf. This will aid in drying, allowing gas exchange to take place (oxygen can get into the soil and potential toxic gases can get out) and also encourage rooting. This will also help to break up a silted layer where that has occurred by mixing existing soil with the silted material to reduce the potential for layer development. An aggressive coring program should be followed in the future to keep mixing the silted soil with that below on sites where much siltation has occurred. Check soil moisture to be sure the subsoil is not too wet. The number of passes needed over a given area will depend on the condition of the turf and soil, as well as the spacing, depth and diameter of the tines on the coring unit.

3) Check for live grass or seed in the soil. In case of turf loss due to flooding one needs to determine if reestablishment will be necessary or if the turf will recover without reseeding. This can be done by bringing sod pieces (as with a cup cutter from a golf course) indoors if the weather is cold. Use several samples (minimum of 4 or 5) from representative areas of the turf. Keep the sod plugs in a place where there is adequate light and freedom from temperature extremes. Keep properly watered and watch for regrowth from crowns, rhizomes or stolons. If regrowth does not appear in adequate quantity in a couple of weeks, scratch the soil surface as might be typical with core cultivation or an aggressive overseeder. If no

germination of existing seed in the soil occurs (as with annual bluegrass on a golf course fairway) overseeding or reestablishment will be necessary. If the turf does recover or adequate germination does occur it will be necessary to fertilize the turf area to encourage the grass to grow and fill in to the density desired.

4) Overseed or reestablish as needed. If there is not an adequate stand of grass from regrowth or germination or if there is interest in establishing a different grass species or variety of grass, then overseeding or reestablishment will be necessary. Overseeding is simpler and quicker. If there is not much thatch overseeding can be very effective. For quicker establishment use perennial ryegrass in your overseeding mixture. If there is too much thatch for the overseeding to be successful, even with aggressive core cultivation, reestablishment will be the option. This means tilling the soil to mix the old thatch layer into the soil and preparing a new seedbed. Should this need to be done, this may be a good time to reshape the site if improved surface drainage is desired. Follow established procedures for soil preparation, fertilization and seeding. For more information see the following Michigan bulletins which are available from your county Cooperative Extension Service office: Ext. Bul. No. E-1401, "Site preparation for lawn establishment"; E-1489, "Grasses for lawns in Michigan"; E-1491, "Seeding a lawn"; and E-1490, "Sodding a lawn."

On football fields the practice of applying seed to thin areas before the last game can be useful. The seed is worked into the soil by the football cleats and will germinate the next spring. This is called a dormant seeding meaning seeding is done after soil temperatures have cooled so much that germination will not occur until the next spring. For further benefit the field could be core cultivated after the last game of the season.

Which of these practices discussed will be useful on your turf depends on the severity of injury on your turf. If the turf site is subject to frequent flooding or is regularly worn by intensive traffic, it is wise to plan ahead by purchasing the proper equipment and supplies needed to apply the practices appropriately.