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There are about 1,000,000 earthquakes a year. *** 29% of the world's surface is land. *** Pres. James Madison weighed 100 lbs.—Pres. Taft 354 lbs. *** Scotland has the lowest murder rate. *** The U.S. Library of Congress is the world's largest—over 33,000,000 items. *** Waves as high as 112 ft. have been recorded. *** Bamboo grows as much as 16 in. a day. *** Orchid seeds average 35,000,000 an ounce. *** Shorthand dates back to 63 B.C. *** Odds against 13 cards of one suit are 15,758,389,000 to one.

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PROBLEMS OF TURFGRASS MANAGEMENT CREATED BY EXCESSIVE RAINFALL

Dr. J. R. Watson, Jr.

The annual distribution of rainfall plays a major role in turfgrass care and management. The ideal situation with regard to annual rainfall would be periodic rains of a gentle soaking nature. Seldom, if ever, does Mother Nature cooperate to this extent. The average rainfall for a given area may remain more or less constant, but the distribution as well as the intensity varies from year to year, and particularly from season to season. It is the seasonal variation in intensity and distribution that creates problems for the Golf Course Superintendent. He must continually adjust his management practices to fit the prevailing weather conditions. The

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techniques employed to counteract the adversities of weather, whether they be drought or excessive rainfall, will to a large extent influence the quality of golf course turfgrass. There will be certain conditions brought on by adverse weather over which the Superintendent will have no control; there will be others which would create special problems, providing adequate materials, equipment and facilities were available. In many instances, however, the Superintendent will be able to counteract the adversities and prevent serious damage to his course. Careful planning and programming based on the facilities available to him, as well as a knowledge of the special features and conditions on the course, will enable the Golf Course Superintendent to produce satisfactory turfgrass in spite of adverse weather conditions.

Excessive rainfall may be classified into two categories: (1) frequent rains, mostly of low to medium intensity; and (2) floods, whether arising from prolonged rainfall or from heavy intense rains of relative short duration. For convenience, the problems associated with these two conditions may be discussed from the standpoint, of the effect they have on (1) Soil; (2) Growth.

Soil. The most obvious condition created by excess rainfall is that associated with drainage—both surface and internal. Surface drainage is the most rapid and effective means of removing excess water. When the soil is saturated from continuous rainfall and the topography is such that water does not move off rapidly, then the excess water will accumulate in the low areas. If the water remains "ponded" for too long a period, turfgrass will be destroyed. The length of time water may remain ponded without killing the grass is a function of the temperature and the species of grass. High temperatures will cause severe damage in a very short period of

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time, whereas if the temperatures are cool the grass will survive for a longer period. *Poa Annua* appears to be quite susceptible to damage from ponded water, while bentgrass is more tolerant.

Surface runoff may cause washouts and severe erosion, especially on newly seeded areas or on steep slopes with thin cover. Floods, particularly along rivers and streams, often leave heavy deposits of silt which may destroy the turf and leave layers that would create future problems. Heavy silt deposits often must be removed in order to restore the flooded area for play.

Heavy slowly permeable soils, when subjected to frequent and prolonged rainfall, become saturated and may remain at or near this level of soil moisture for extended periods. Under such conditions there will be a deficiency of oxygen and a build-up of reduced compounds which are toxic to turfgrass.

Iron chlorosis will be quite prevalent under these conditions. Spraying of iron sulfate or chelated iron compounds during these periods will be most beneficial.

Desiccation—wilt—is more likely to occur when internal drainage is poor and it may become necessary to syringe turf frequently in spite of the fact that the soil may be at or near the saturation point. This is especially true if temperatures or wind movement are high.

One of the more serious and direct effects of excessive rainfall on soil is structural deterioration. This may result from the beating action of the raindrops, or from the traffic—both player and equipment—to which the area is subjected. Permanent rutting and footprinting is likely to occur if the wet soil is subjected to traffic during these periods.

Spike disking of greens during the summer months will do much to offset some of these adverse effects. Spiking is recommended over aeration during the summer because of the reduced growth activity of cool season grasses during the summer.

Growth. The prevailing temperature and the fertility level of the soil also must be considered in a discussion of the effects of excess rainfall on growth activity.

Prolonged rainfall will tend to extend the spring-like growth of turfgrass if the temperatures are moderate. Such conditions result in a soft succulent turfgrass that is easily damaged by traffic (has poor wearability) and which is more susceptible to attacks by disease and insects. These factors weaken the permanent turfgrass and open them up for weed invasion. Sudden "hot spells" during such periods intensify these situations and may prove disastrous.

Courses subjected to heavy play will suffer to a greater extent than those with light traffic. The frequency of fertilizer applications, especially of nitrogen, will have to be increased to offset that utilized for the additional growth, as well as that lost by leaching.

From the standpoint of disease incidence, it is well to remember that the effectiveness of fungicides may be reduced by heavy rainfall. More frequent applications may be necessary and the use of a wetting or "sticking" agent is recommended. Algae and fairy ring activity will be greater. (Fairy rings appear to have been especially noticeable this season. Dr. Rowell of the University of Minnesota has suggested the use of cadmium compounds for this disease. He suggests drenching the active area with a solution four or five times as strong as the normal rate.)

Annual weed growth, especially grasses such as crab, barnyard, pigeon foxtail, etc., as well as clover, chickweed and knotweed will be much greater during wet rainy seasons. Chemical treatment of these weeds with the appropriate herbicide will aid materially in controlling their increase.

For sterilizing areas to be replanted, Methyl bromide and Vapam are suggested.

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