

Water, Weeds Waste the Maintenance Budget*

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THE RELATIONSHIP between water and weeds is rather universally recognized and has been well documented by both experimental and observational data. The relationship between water, weeds and waste has been, perhaps, given less consideration. Yet, that such a relationship exists cannot and should not be overlooked by anyone interested in the care and management of turfgrass. The alarming drop in ground water reserves in certain sections of the country during the past few years is just cause for grave concern. This alone serves as adequate justification for devoting considerable thought to any discussion that may result in the more efficient utilization of water.

Water is an essential component in all phases of turfgrass growth and activity and is involved either directly or indirectly in all operations pertaining to the care and management of turf. Hence, water and watering practices may very well provide the key to efficient and economical operation on golf turf areas. The presence of undesirable vegetation (weeds) on any turf area conceivably could be a contributing cause to waste — waste of water, of plant food, of labor, time and money, to say nothing of the impairment of the aesthetic value and usefulness of golf course turf.

Water and Waste

The first consideration in a discussion dealing with the relationship between water and waste is the cost of the water itself. Too often, we are prone to think of water as being "free". Water is seldom free and should never be considered as such when it is used on turf.

Recently a city of 50,000 population reported an average daily water consumption of approximately 24,000,000 gals. It was estimated that one-third, or some 8,000,000 gals. of this amount, was applied to grasses and shrubs. The replacement value of this city water plant was estimated to be approximately \$15,000,000; therefore, some \$5,000,000 of the investment may be

charged to the turfgrass areas of that city. Obviously, only a relatively small part of this could be charged to the golf courses; nevertheless, these figures serve to illustrate that considerable monies are involved in providing water for turf areas.

Water for a golf course is costly, whether the source is from municipal systems, or whether the course installs its own pumping plants and utilizes water from deep wells, natural or man made lakes or streams. Further costs are involved in the installation of watering systems and for the equipment needed to apply water to turf areas. Expenses do not stop once the initial investment in the irrigation system has been written off. Each time the pumps are started it costs a few cents for the power to run them, and, of course, there are labor costs involved in the application of the water.

The saving of only a few gallons of water daily, whether by the judicious use of water or by efficient operating procedures, could mean a sizeable savings on an annual basis.

Weeds and Waste

Weeds contribute to inefficiency and waste in a number of respects. Weeds encroach when the turfgrass becomes weak and unable to compete successfully for water, air and nutrients. Misuse of water is only one of many basic factors that might be responsible for loss of vigor and aggressiveness, with resultant weed invasion of the turf area. Other fundamental causes of poor turf include: poor physical soil condition (compaction, drainage); low fertility, or in some cases improper balance of plant food elements; and adverse climatic conditions.

Economical weed control measures must, of necessity, begin with the correction of the fundamental cause of the poor turf. Merely eliminating weeds from a turf area, whether by cultural or chemical means, will not result in permanent eradication. Indeed, considerable waste in the form of herbicides and labor may be experienced if weeds are destroyed chemically and no pro-

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visions made to insure a dense growth of turf on the area. Unless the bare areas are quickly covered by vigorous, healthy turf, weeds will again appear.

In addition to the element of waste involved from a failure to correct the primary causes of weed encroachment, there is another area that should be considered. When weeds are present in turf, they are competing for moisture, air and nutrients that otherwise could be utilized by the turfgrass. Thus, weeds may be considered a definite liability simply by their presence in golf course turf. They add to the cost of maintenance, and contribute to waste because they are "robbers".

Water, Weeds, Waste—and Management

The successful and efficient use of water, which may result in a reduction of the weed problem and elimination of waste, is predicated on three basic factors—the grass, the soil and the climate. It would be difficult to say that one is more important or more influential than the other. Each exerts a direct influence on water use, and any one of them may be modified by the other two; thus, all are of paramount significance in their relation to water, weeds and waste. Certain inherent morphological and anatomical characteristics of grasses, along with the environment in which they grow, govern the amount of water required to sustain satisfactory turfgrass growth.

Rooting habits, rhizome formation and leaf characteristics are some of the features responsible for differential water requirements of turfgrasses.

Climatic factors such as rainfall, temperature, humidity, air movement and light intensity influence the amount of water transpired and, hence, the amount of water required. Physical soil factors — texture, structure and uniformity, along with chemical factors, such as fertility, reaction (pH) and the ratio of the various plant food elements likewise influence the water necessary for desirable turfgrass growth.

Dictating Correct Choice of Grass

Choice of the correct grass for a specific set of environmental and use conditions may result in the conservation of water, and go a long way toward checking invasion of weeds. There are a number of different species and strains of turfgrasses available for use on golf courses. There is sufficient variation in their rooting habits, their turf-forming qualities, and their reaction to a given set of environmental conditions to permit selection from the standpoint of their ability to resist weed in-

vasion. In the northern sections on close clipped and watered fairways, bentgrass is much more inherently capable of resisting weed invasion than bluegrass or fescue. Similarly, in the south there are dense, tight growing types of Bermuda that resist weeds much better than other upright open growing types.

One of the most important inherent differences lies in the potential rooting ability of the different plants found on golf courses.

The relationship between high moisture levels and *Poa annua* infestation has long been recognized. A close correlation between crabgrass and water has likewise been established. Watson and Harper at Penn State have shown that as soil moisture content increases and is maintained, there is a corresponding increase in crabgrass. Both of these annual weeds develop profusely branched, but shallow root systems.

The perennial turf grasses, as a group, are capable of deeper rooting habits than most of the annual weedy grasses. Bob Hagan, in his work at Davis, California, has shown a close correlation between depth of rooting and frequency of irrigation. It would appear that where rainfall is not excessive and water may be applied in a manner conducive to the development of deeper roots by the perennial turf grasses, judicious and economical use of water will aid considerably in checking the weed problem, thereby reducing waste.

Heavy watering during the summer when cool season grasses are not growing too actively, favors the encroachment of certain weeds. Frequent and excessive watering sets up a series of environmental conditions (saturated soils, leaching of nitrates, poor aeration, etc.) which favor the development of weeds. If this practice is permitted during the time when the grass is semi-dormant, it almost surely will lead to the development of disease which will further weaken the turf and permit weed infestation. Thus, selection of adapted grasses, coupled with adjustment of watering practices to the requirements of the turfgrass, contributes to more economical operation.

Waste in Relation to Soil

The physical and chemical properties of soil exert a marked influence on watering practices. It is through modification of the soil that the greatest opportunity for adjustment to climatic conditions exists. The physical condition of the soil (texture,

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who's called on when the team needs a yard, is the labor force.

Daniel made it plain that the turf team, like the football team, had to work together with every man being good and filling his assignment or there'd be no victory.

He cited research problems involving complicated factors that had the quarterback (supt.) calling on an end (research) for making the distance. He mentioned that on poa annua research alone there were over a thousand different tests being made at Purdue.

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structure and uniformity) governs the infiltration, retention and movement of moisture in the soil medium, controls the air-water relationship, and along with the chemical properties, determines the type of vegetation that grows most satisfactorily under a given set of climatic conditions.

A brief listing of a few of the many and

varied ways in which the soil influences watering practices, and thereby has a direct bearing on the subject of weeds and waste, may serve to illustrate its importance.

Physical properties — Texture (particle size) should be variable to prevent packing and promote drainage. Structure (arrangement of particles) should be granular and well aggregated to insure variable pore size distribution which promotes desirable air-water relationships. Such is desirable because:

(1) Compacted and poorly drained soils favor invasions of clover, knot weed, chickweed and pearl wort; (2) Compacted and water-logged soils restrict the development of deep root systems; (3) Layers of sand, clay or organic matter interfere with normal air-water relationships and contribute to poor root development; (4) Good drainage helps counteract effects of excessive rainfall — prevents water-logging; (5) Hand watering may be required when greens are not properly graded or are not uniform in texture and structure.

Chemical properties — (1) High nitrate levels, coupled with excessive water, produce succulent turf which is more susceptible to disease and insect injury, with subsequent invasion of weeds; (2) Improper balance of nutrients may favor weed invasion — Clover thrives under low nitrogen and high mineral element levels; (3) Excessive watering leaches nitrates from the soil; hence, weakens turf or necessitates the use of additional nitrogen fertilizer, either of which may be uneconomical; (4) Too low or too high a level of lime brings about unfavorable chemical situations which weaken turf and favor weed growth.

Waste in Relation to Climate

Essentially, the only climatic factor over which man may exert direct control is rainfall. Man may alter the effect of rainfall in two ways. First he may irrigate if rainfall is deficient, and second, he may provide for rapid removal of excess rainfall by proper surface and subsurface drainage, and by altering the texture and structure of the soil, insure effective percolation of the water. By choosing an adapted grass, man may indirectly offset the adverse effects of temperature and air movement to a rather limited degree.

Syringing of golf greens during periods of high temperature and wind movement may prevent loss of turf. Loss of turf from desiccation (winter kill) may be avoided by proper water application in early spring. Judicious use of water during periods of

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"TURFGRASS"

The American Society of Agronomy, at its Dallas, Texas meeting in November last year agreed to the use of the single word "turfgrass" as a descriptive term wherever appropriate. Chairman Fred V. Grau of the Society's Turfgrass Committee explained that the new word was coined to dispel any implication that work with turfgrass was connected with horse racing. The Society suggests that all American turfgrass conference groups seriously consider the adoption of the new term.

semi-dormancy will tend to keep turf in condition to resist weed invasion, whereas excessive moisture applications during these periods will encourage weed growth.

Thus, adjustment of watering practices to conform to climatic conditions may eliminate weed invasion and prevent waste.

The grass, the soil and the climate, then are the basic factors involved in the development of an efficient, satisfactory watering program. The soil factor lends itself to alteration and modification by man, but man exerts essentially no control over the climatic factors and only limited control insofar as the particular grass he may utilize for golf course turf. Since man is able to exert considerable influence on the physical and chemical properties of soil, it would appear that his efforts should be directed toward developing a soil medium as near ideal for the growth of turfgrass as practical limitations permit.

By so doing, watering more nearly in accordance with the requirements of a particular grass will become feasible and the golf course superintendent will be in a more favorable position to adjust his watering practices to meet changing weather conditions. Careful and considered attention to all three factors may do much to promote the efficient use of water, control weeds, and to eliminate waste.

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