CALIFORNIA TURFGRASS CULTURE
FORMERLY, SOUTHERN CALIFORNIA TURFGRASS CULTURE

VOLUME 27, NO. 3 SUMMER, 1977

INTRODUCTION TO LAWNBOWLING"

*J. Michael Henry***

The origins of lawn bowling reach back into the Dark Ages. It is mentioned as a favorite sport of the military gentry of Europe and the British Isles in the 1300's (3,5). In fact, during this period, King Henry VII outlawed the game of lawn bowling due to the fact that the soldiers were spending too much time bowling to the neglect of their archery practice.

By the year 1588 A.D. bowling was back in favor and history records that Sir Francis Drake was engaged in a game of bowls when he was informed of the approach of the Spanish Armada, a fleet of warships sent to attack England by Phillip III of Spain (5).

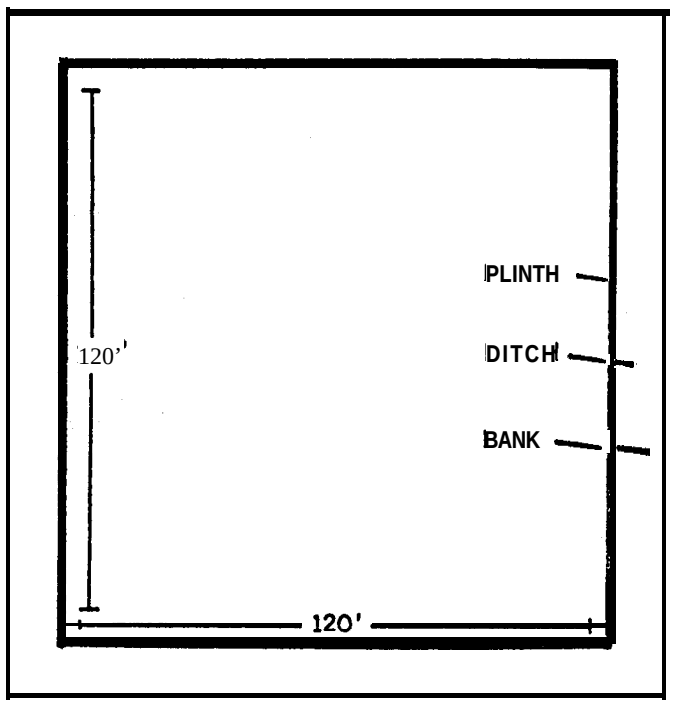
From England the game was spread throughout the British Empire and is still quite popular in Australia, South Africa, New Zealand and Scotland. Other sports that owe their beginnings to the game of lawn bowls include billiards, curling and bowling (indoor). It is interesting to note that lawn bowls predated the game of golf by hundreds of years as the first game to be played on a "finely manicured" turfgrass green.

Lawn bowling never reached great popularity in Canada or the United States, but it is gaining numbers especially with members of the senior citizen population in the United States. Currently, there are approximately 38 cities in California alone that support one or more lawn bowling greens, either through their local parks department or a private group or organization.

GREEN DIMENSIONS

The bowling. green is basically a square-most commonly 120 feet by 120 feet, although it can vary from a a minimum of ll0-feet square to 125-feet square or greater (2,4). The green surface is bound by a wood or concrete border topped by a wooden cap referred to as a plinth (see figure 1). A roughly, 2-inch deep ditch surrounds the green. This was originally a drainage ditch when the greens were irrigated by flooding. They still function in this capacity on many sprinkler irrigated greens. The outer wall of the ditch is simply termed the bank. It rises 9 to 12-inches above the surface of the green and serves as a stop for overthrown bowls (1,2). It is commonly constructed of wood or concrete (see figure 2 and 3).

FIGURE I



BOWLING GREEN DIMENSIONS

The bank surface is usually concrete or mown turfgrass, making it useful as an area for spectators and players to observe the play off the playing surface.

The surface of the green bears directly on the play of the game and the skill involved in placing the bowls.

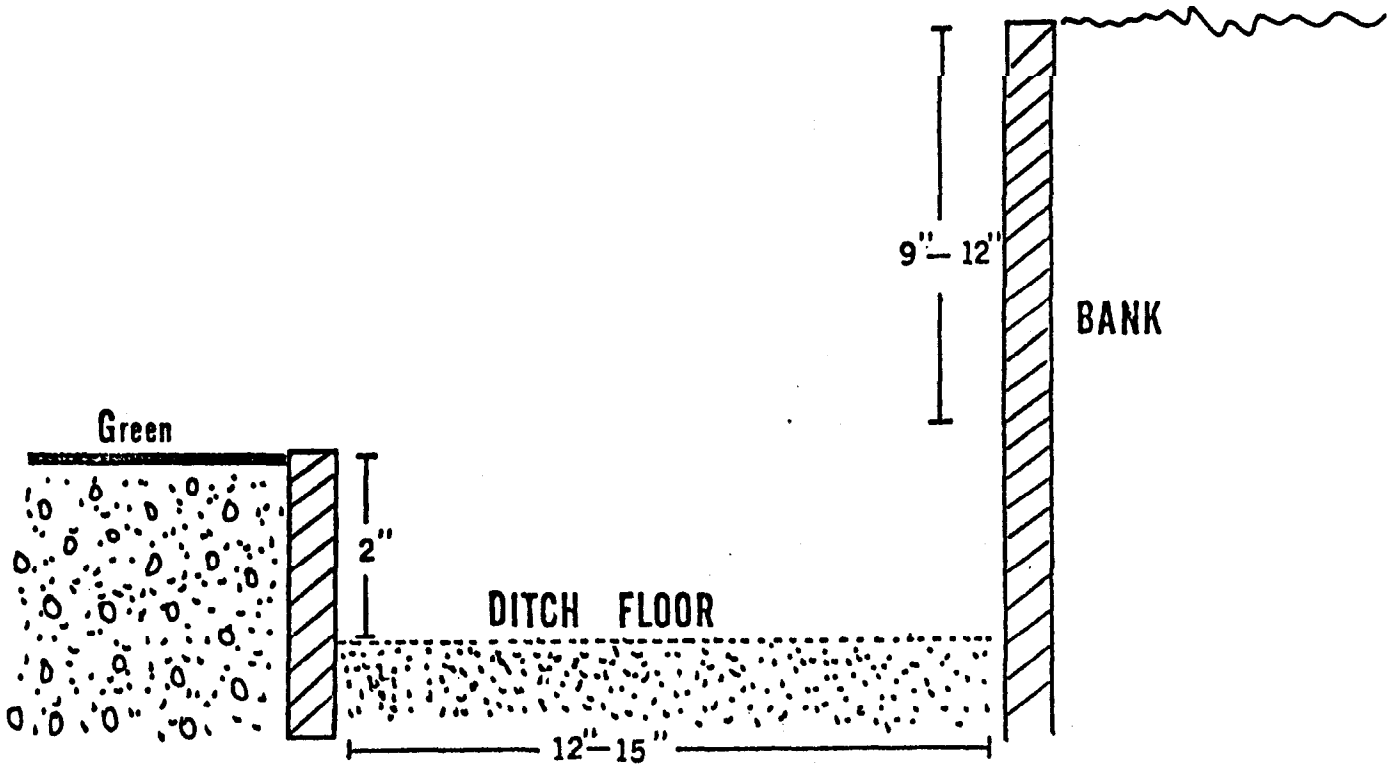
The turf is maintained from 1/8-inch (Hybrid Bermudagrass) to $\frac{3}{16}$ or 1/4-inch (Creeping Bentgrass) and the thatch produced by the grasses is ideally kept to an absolute minimum to achieve a hard, fast playing surface.

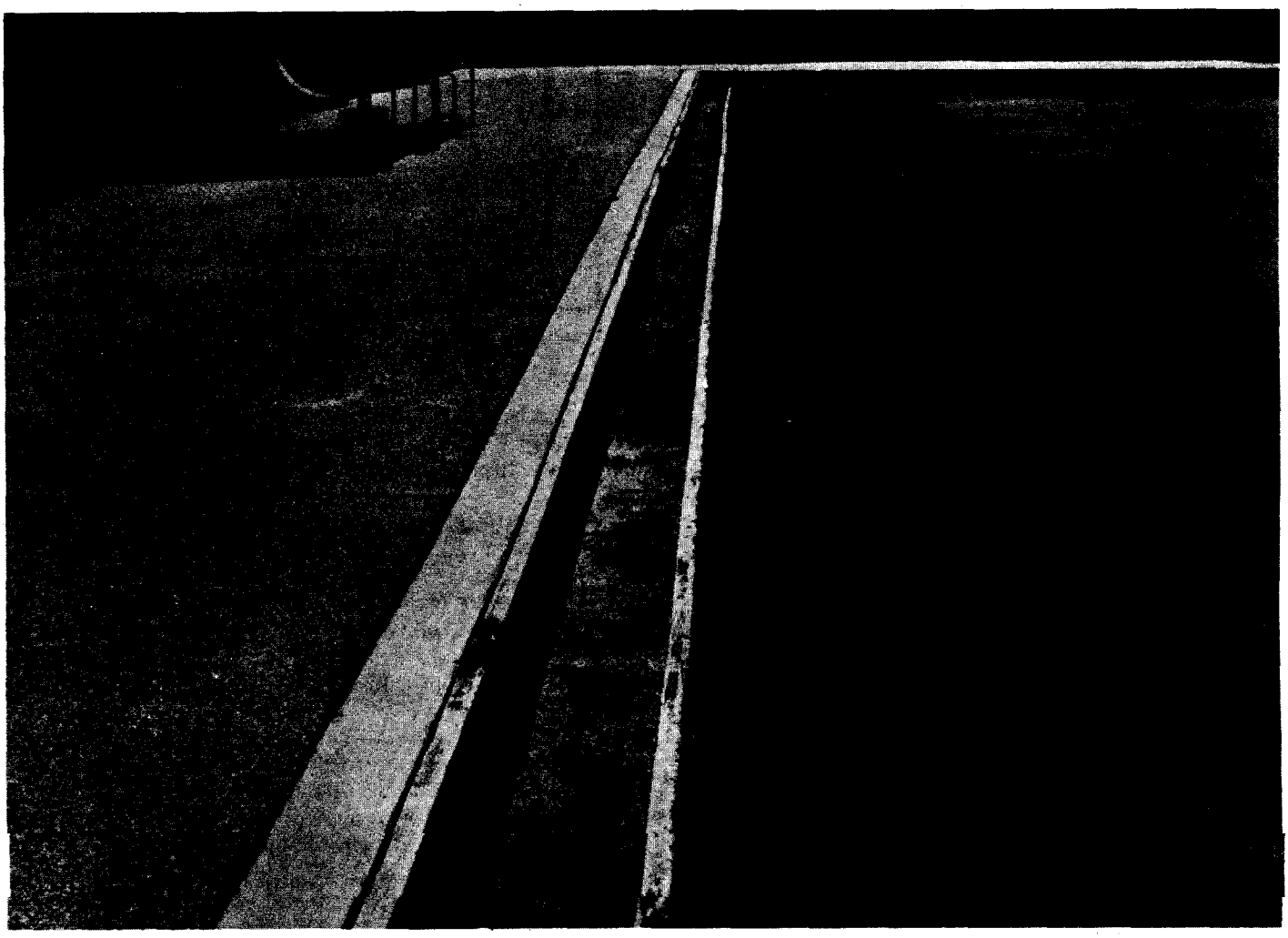
So important is the condition of the green's surface that an objective measurement of the time a bowl takes to travel a distance of 90-feet is used to compare green conditions. This measurement is called the "speed of the green" (4). A green with a speed of 10-seconds is slow, one of 16-seconds is fast. This seemingly incongruous statement can be explained thusly: a hard, firm surface supports the bowl with less frictional drag, so a bowl can

*From: Proceedings of the 1977 Turf and Landscape Institute.

**Farm Advisor, Orange County.

FIGURE 2





be thrown rather softly, yet still reach the end of the 90-feet distance. A slow green, on the other hand, requires that the bowl be rolled harder and thus faster in order for it to overcome the friction imposed by thick, spongy thatch and/or saturated soil to reach the end of the 90-foot lane. This explains how a bowl rolled on a fast green actually takes longer to cover the given distance than it would on a slow green. Possibly, no other game played on a green is so closely tied to the condition of the surface of the green.

PLAY OF THE GAME

The object of the game is to get one's bowl closest to the white target ball (called the Jack) some 90-feet away at the opposite end of the lane. The skill comes in rolling the elliptical, lopsided bowls in a curving path to avoid any previously thrown bowls that may be blocking the jack or to knock the jack into a more favorable position or move an opponent's bowl to a less advantageous location.

Although the game has not achieved the popularity of golf in this Country, it certainly provides an exciting, outdoor sport to many elderly men and women and may eventually be played by a greater number of younger persons as the game becomes more well known.

LITERATURE CITED

1. **Anonymous, 1976. Sports Turf Review, New Zealand Turf Culture Institute. December, 1976, No. 106:205.**
2. **Anonymous, Turf Culture. New Zealand Institute for Turf Culture, Palmerston North, New Zealand, pp. 234-238.**
3. **Beard, James B.. 1973. Turfgrass Science and Culture, pp. 2.3.**
4. **Haley, Edgar R., 1976. Construction of the Lawn Bowling Green, pp. 2.5.**
5. **Hanson, A. A. and F. V. Jush, 1969. Turfgrass Science, pp. 1.5.**

SOILS AND SANDS FOR BOWLING GREENS*

*William B. Davis***

Very few California lawn bowling greens afford good bowlers consistently good game conditions. We tend to blame the poor condition of a green on the greenskeeper, while, in fact, many greens were doomed to failure from the day they were constructed. Even with the technical skill of the greenskeeper and an unrestricted budget, it may be impossible to have good bowling as the rule rather than the exception if the growing medium of our green has the wrong physical characteristics.

Good bowling conditions require a very firm, dry surface which is perfectly level. This surface needs a vigorous turf which is mowed at a height of 1/4 inch or less. This turf must be maintained with a minimum of thatch and/or mat below the grass blades. In order to achieve this desired surface, the growing medium becomes the limiting factor. Few, if any, natural or amended soils possess the physical characteristics required.

In order to grow any plant light, oxygen, water, nutrients, and a growing temperature are required. These must be in proper balance for the species of plant we wish to grow. Generally, we do not have to concern ourselves with light and temperature because these environmental factors usually are not major causes of poor bowling conditions. Nutrition of grass management is pretty well understood and can be supplied by any competent greenskeeper. Our real problem lies in maintaining a proper balance of the oxygen and water available to the grass roots while at the same time producing a firm, dry surface.

Clay soils, loam soil or even loamy sand soil are all highly compactible, and, once compacted, accept water slowly and do not afford good aeration to the roots. Many of these soil media can afford good bowling conditions but only for limited periods of time. After an irrigation, it may take two to three days before we have a good, dry surface. Typically, we find ourselves relying on frequent aeration and use of heavy rollers in an attempt to improve the bowling surface. We are continually sealing up the soil media, and, without a good balance between oxygen and water, we limit root growth. This weakens the grass, and disease takes over. Even under the best of conditions, excessive use will thin out our turf, but recovery can be rapid with the right growing medium.

Ideally, we want a medium for a bowling green which will accept water rapidly, will retain available water for a reasonable length of time, and will have a good balance of water and oxygen in the root zone while at the same time give a firm, compacted surface.

For many years individuals as well as several public agencies have worked with various soils and amendments to achieve a proper growing medium for high traffic, extensively used turfgrass areas. The University of California has done extensive work in this area. We now generally recommend a very uniform type of medium to fine sand-unamended-to meet these very demanding turfgrass areas. Most of the applied research was initiated and developed for golf green construction and management, but the basic principles also have been adapted to football fields and bowling greens. While each of these high-use athletic areas is managed for quite different activities, they do have many things in common. Their turf surfaces are subject to much traffic and, therefore, are subject to all of the problems associated with a compacted growing medium. Their turfgrasses are subject to intensive wear and must have optimum growing conditions to recover from that wear. They also are recreational areas in which near perfect conditions for the games to be played are expected. Without these near

***From: Proceedings of the 1977 Turf and Landscape Institute.**

****Extension Environmental Horticulturist, Univ. of Cahf., Davis.**

TABLE 1. Sand Particle Size Distribution Range for Construction and Topdressing of Bowling Greens

Class	Fine Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay
Sieve Opening M M	4.00 to 2.00	200 to 1.00	1.00 to 0.50	0.50 to 0.25	0.25 to 0.105	0.105 to 0.053	.037 and below	
U.S. Standard Sieve Number	10	18	35	60	140	270	....	....
Range			←	key fraction (-50 to 75% 85to95%	→	←	4to8%	→

perfect conditions, it is almost impossible to demonstrate the skills required by the games.

The types of sands we recommend for bowling greens are not substitutes for a competent bowling green manager. Early nutrition is very critical to proper establishment of a green grown on pure sand. It is now possible for the skilled manager to achieve and maintain that firm, dry level surface which will support a vigorously growing tnrf.

There is no single sand with one rigid set of specifications that is recommended for bowling greens. Table 1 shows the range of particle size distribution which will produce the type of medium suitable for good bowling greens. We have studied these sands under field conditions where the sand is placed 12 inches to 16 inches deep to the interface of the parent and/or subbase soil. A tile system is usually required at this interface in order to remove water that may accumulate at the interface. The subgrade may be nearly level with minimum depth trenches to give the tile lines a positive fall of 1 percent. We do not recommend and cannot justify the cost of a rock blanket or so-called rock drainage layer between the sand and the parent or subbase.

Examples of several native and/or screened sands judged suitable for bowling greens are presented in Table 2. None of these sands are commonly found at the local sand and gravel company which primarily functions to supply concrete and plaster sand for construction. Where sufficient demand exists, there are several companies now supplying these special sands. In some areas we have good natural deposits, but their costs can be high if they must be transported a great distance. In many cases they are less costly than a local plaster sand mixed with some amendment which may or may not give the desired medium.

You might compromise on your tile system; you might compromise the irrigation system; and you might compromise the development of the area surrounding the green, but you should not compromise on the growing medium for a bowling green.

TABLE 2. Some Typical Sands Suitable for Bowling Green Construction and Topdressing (Percent Retained on Each Sieve)

Sand	10	18	35	60	140	270	Silt	Clay
*30-60 Crysta l Silica Oceanside	0.0	0.34	33.0	45.4	17.70	2.26	1.90	0.40
*On-Site Ceres Washed Sand	0.3	0.5	11.0	50.5	33.8	2.60	0.70	0.40
Santa Cruze Aggregate 1070	0.4	0.76	2.48	66.14	26.84	2.00	1.50	0.50
*Monterey 30 Mesh	0.0	0.0	22.16	61.16	15.10	5.10	0.12	0.80
*Manteca Washed	0.0	1.62	18.4	49.08	27.66	1.82	1.10	0.2
Dillon Beach	0.0	0.42	2.86	48.10	44.80	1.48	1.00	1.20
Ocean View Mendocino	0.0	0.12	0.66	69.94	28.40	0.38	0.50	
Fortuna	0.24	0.22	0.86	60.46	34.96	0.50	1.20	210
Pacific Grove	0.00	0.18	14.26	78.02	5.82	0.16	0.0	1.20

*These sands are at the upper limits due to the percentage of coarse sand in relationship to the medium and fine sand fractions.

PRACTICAL MANAGEMENT OF THE LAWN BOWLING GREEN" Fundamental Aspects

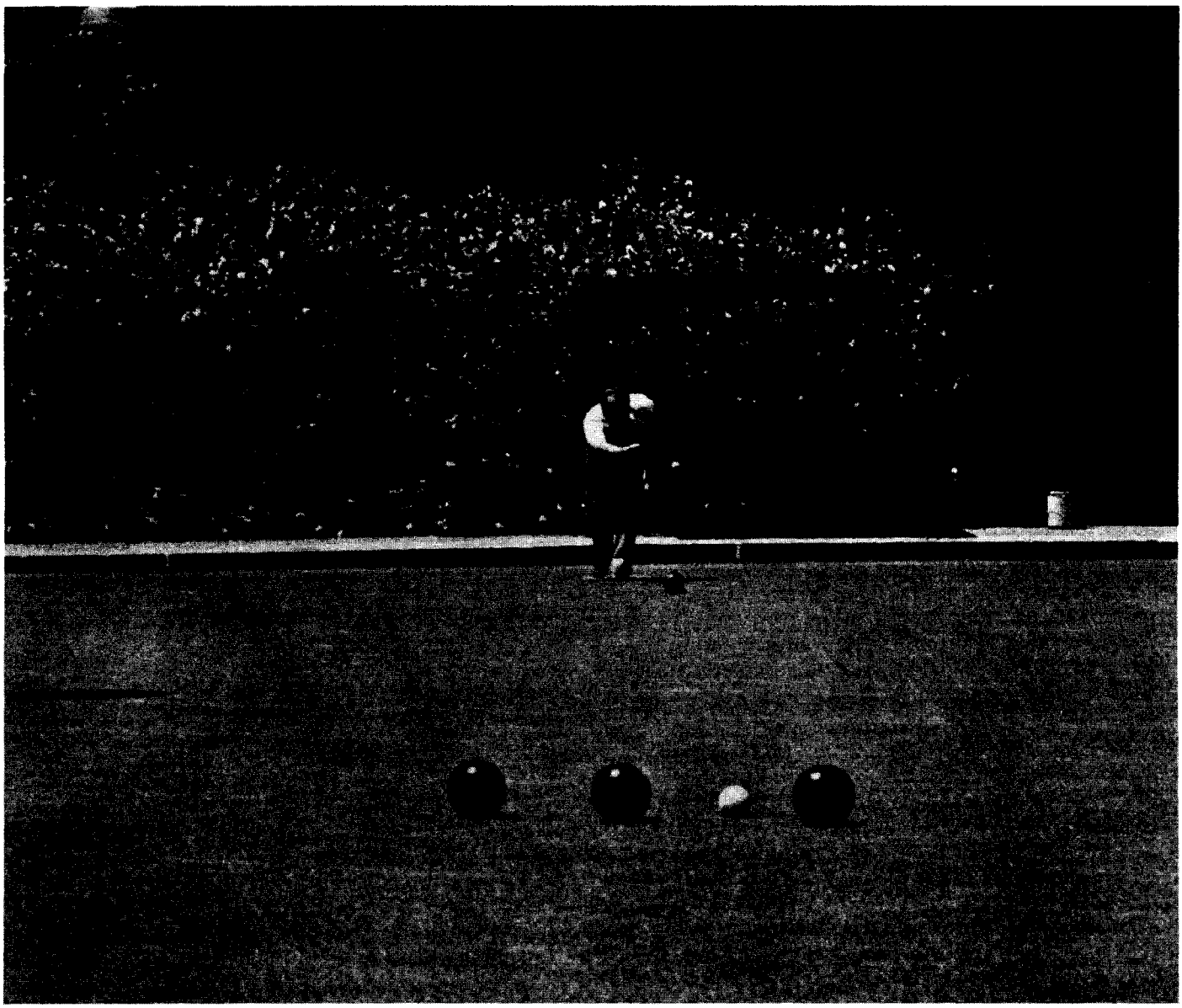
*Edgar R. Haley, M.D.***

In order to discuss the management of a lawn bowling green, it is necessary to decide exactly what constitutes the ideal green. What exactly are the attributes for which we are striving?

The ideal bowling green is an area of turf which is a completely level, completely smooth, hard, dry surface, supporting a healthy uniform turf no higher than 1/8" above the actual soil.

Within the past five years bowling greens are being constructed scientifically on the basis of well accepted research findings of the horticultural departments of universities, the world over.

To approach the ideal is far simpler if we have a properly constructed green. However, the vast majority of greens antedate these scientific principles and the present problem is to produce an acceptable bowling surface upon this vast majority of older greens.



First off, it must be well understood that bowling greens are not to be equated with golf greens, and the

*From: Proceedings of the 1977 Turf and Landscape Institute.

**M.D., retired, Escondido

principles involved in the management of the one is very definitely different from the other. A bowling green managed along the lines of the golf green is invariably wretched. In contrast to the golf green, the bowling green surface is hard; it is dry; it is absolutely flat and absolutely level.

The turf contains no thatch whatever, and the grass is mowed to less than half the height of that of the golf green. In short, the bowling green is tremendously more exact and critical.

The basic key is to obtain a strong healthy turf. Given a strong healthy turf, the obtaining of a good bowling surface is primarily mechanical.

I. lrrigation

Without question, the most important factor in developing a deeply rooted healthy turf lies in proper irrigation. The great majority of greens in this country are tremendously over-irrigated-literally in the state of near drowning.

Grass, along with all living organisms, has three primary requirements: oxygen, water, and nourishment. Of these, the oxygen is by far the most important. Water is important, although less so; and nourishment is relatively unimportant compared to the first two.

With this fundamental necessity for oxygen to the roots, it can readilv be understood that a soil continuously saturated with water is denied adequate oxygen. The turf is sick, spindly, puny, shallow rooted and sooner or later actually dies.

Only as the water is drained or evaporated from the soil can oxygen enter the soil to the root level. Therefore, after bringing the soil to field capacity, no further water should ever be added until drying occurs sufficiently to allow oxygen to reach the roots.

Thus, the basic problem for proper irrigation resolves itself into two aspects: first, that of adding water to field capacity only; and second, to withhold any further irrigation until such time as, through evapotranspiration, the soil has dried sufficiently to allow oxygen to reach the roots.

From the practical point of view, the question is how do we water a poorly draining soil to field capacity only and exactly how long should further irrigation be withheld?

In the first instance, field capacity is obtained by applying water uniformly at a slow rate until "splash" occurs, denoting that water is being added at a faster rate than the soil can absorb it. After an appreciable interval, water is again applied and if "splash" occurs quickly, the soil is at, or close to, field condition.

The big question is how long do we hold off before again irrigating? All of us feel that we can tell by "experience" when turf probably needs water. When in doubt we can take a plug of the soil and examine it, and if any question, we pour on the water. This I personally did for 15 years, trying to be careful not to overwater, and finally believed I had become fairly adept with this problem.

About three years ago I obtained a particularly fine tensiometer which was accurate and quick. This scientific instrument records within one to two minutes exactly the amount of available moisture. Quickly I found that I had been irrigating at least five times oftener than I should, even though I had been well aware of the hazards of overwatering.

At field capacity, the tensiometer will read 0-2 centibars. Little or no stress occurs below a reading of 50 for bermudagrass. However, I suggest that irrigation be repeated when drying takes place to give a reading of half this level, at 18-20 centibars. At this low point there is loads of available moisture present.

With the use of this simple program of watering to an exact sufficiency and delaying the next irrigation until it is needed, virtual miracles have been accomplished in developing strong turfs on bowling greens which had been simply wretched for years previously.

With a relatively strong healthy turf, the obtaining of a smooth, level, hard surface desirable for bowling is simply a mechanical process.

II. Thatch Control

A golf ball "floats" over the surface of the turf. A bowling ball depresses the turf and rolls along the surface of the soil. It can easily be understood that if the grass is allowed to be higher than 1/8" to $\frac{3}{16}$" or if there is any spongy thatch present whatever, then the bowling ball behaves in a sluggish fashion, giving a "slow," miscrablc game.

Therefore, no thatch or mat, whatever, can be tolerated.

The effect of excess thatch in the golf green can be controlled by regular topdressing. In no way is this method satisfactory for the bowling green. Rather, for the bowling green, the thatch or mat must be removed at regular very short intervals, as it develops.

The standard machine for removing thatch is the vertieutter, which was designed for use on golf greens. It does an admirable job on the undulating golf green but for the flat surface of the bowling green it does not produce the result of a large, flat machine as the scarifier, or particularly, the greens planer.

The scarifier[1], is a frame 7' x 4' which slides over the green with a center plank having rows of steel nails which remove thatch on a wide flat plane. Along with thatch, all lumps and ridges are removed, producing a flat smooth'surface. Used on a reasonably healthy turf about once a week, this simple instrument can produce a remarkable improvement. It must be supplemented by a verticutter about four times a year.

Recently, a machine, the Escondido greens planer' has been developed which produces an astonishingly superior surface on the bowling green. The greens planer is a flat frame, 6' x 4', sliding on skids with whirling verticutter blades in the center. It is propelled by a centrally placed 12 h.p. garden tractor. This machine, along with a large special mower for bowling greens, is probably the most important piece of equipment for obtaining and maintaining a smooth hard flat surface.

Regardless of the mode, the removal of thatch in its entirety is fundamentally essential. It should be removed on a weekly basis, to the tolerance of the turf. A strong healthy turf easily withstands this treatment, especially so if the vertical cutting aspect is minimal per use, with the machines being used at very frequent, regular intervals of about one week or oftener.

III. Leveling of Bowling Green

The average good bowling green in the U.S. has a variation in heights or levelness of from 4" to 6". This, of course, causes a marked variation in the "draw" of the bowl and reduces the skill of the game. To level a green it must be surveyed. The surface is divided into a checkerboard pattern, on ten foot centers. A rope, marked every 10' is stretched across the green at 10 foot intervals. A water manometer[3], easily constructed, and not only more accurate but faster and easier to use than a transit, is used to measure the relative elevations of the given points. From these readings contours of 1/8" levels are drawn on a grid. From this map the gross depressions are chalked on the turf. Sand, to a depth of l/32" to l/16", is spread evenly over the depressed areas, using an ordinary cyclone spreader. The areas are dragged with the steel mat and the sand is then "watered in" by a had held hose, to the soil level.

There is nothing to be gained in applying a greater depth of sand as greater depths tend to smother the grass, interfere with the bowling, and only when the added soil is incorporated into the sod is it assimilated. While adding small increments may involve a greater labor, the correction of the low areas is more rapid and more accurate.

To lower the elevated areas is very difficult and can only successfully be accomplished by actually raising the sod, removing the underlying soil and replacing the sod.

IV. Mowing

The careful mowing of the grass of the bowling green is an important fundamental process if a smooth even surface is to be obtained. Great care for the details is most important.

Needless to say, the mower designed specifically for this function is entirely desirable. This mower[4] is large (30" cut) and heavy (350 lbs.), with a relatively large base. It is beautifully balanced and easily handled. The smooth surface obtained is markedly superior to that produced from the comparatively small mower used for golf greens.

Mowing, along with all machines used on the bowling green, must always be performed on a 45" angle to the play. Each cut should overlap by 50 percent and it must be done in two directions, at right angles to each other. This results in four actual cuts to the turf each time the green is mowed.

From research, the turf is ideally mowed six days out of the week. Not only is this desirable for the bowling, but it is well accepted that removing small increments at a time causes much less stress than less frequent mowing with a removal of a greater portion of the leaf each time.

It goes without saying that the mower must be kept in careful adjustment, and the blades sharp. The hands should never weigh on the mower handle but be used only for guidance. The motor should always be declutched when turning, to prevent gouging the turf. All clipping are always removed.

The height of cut should be 1/8" in summer for Tifgreen, and 1/4" during winter. The opposite is better for the cool season grasses, in Southern California.

Summarys

Even the most wretched and miserable bowling greens can be improved to the point of creditable bowling. The basic fundamental lies in developing a relatively strong turf. Careful intelligent irrigation is by far the most important factor.

Complete removal of thatch; use of the scarifier or, better, the greens planer to achieve a flat smoothness; careful leveling of the surface and frequent mowing with a proper bowling green mower, will produce a bowling green that is a delight for play. There are, of course, a number of other factors involved and desirable but the important fundamentals have been discussed.

---

[1]The scarifier. Description and plans for building found in "Management of Lawn Bowling Green," page 30.

[2]Description for use and manufacture is found in "Maintenance of the Lawn Bowline Green." page 89.

[3]Description found, "Maintenance of the Lawn Bowling Green," page 34.

[4]We use the Scott Bonnar Queen, from Australia.

CALIFORNIA TURFGRASS CULTURE
Department of Plant Science, University of California
Riverside,. California 92502
Editors, Victor B. Youngner and Victor A. Gibeault

CALIFORNIA TURFGRASS CULTURE is sponsored and financed by the regional Turfgrass Councils and other turf/landscape organizations. Subscription to this publication is through membership in one of the councils listed below.

LOS ANGELES CHAPTER
SOUTHERN CALIFORNIA TURFGRASS COUNCIL
1000 Concha St., Altadena, Calif. 91001
President . .. Bob Davidson
Secretary James Prusa

CENTRAL COAST TURFGRASS COUNCIL
3854 Center Ave., Santa Barbara, Calif. 93110
President ..... Bill Norton
Secretary .. Edward C. Avila

NORTHERN CALIFORNIA TURFGRASS COUNCIL
P.O. Box 268, Lafayette, Calif. 94549
President . .. Phil Wyatt
Secretary . .. George Heinrichs