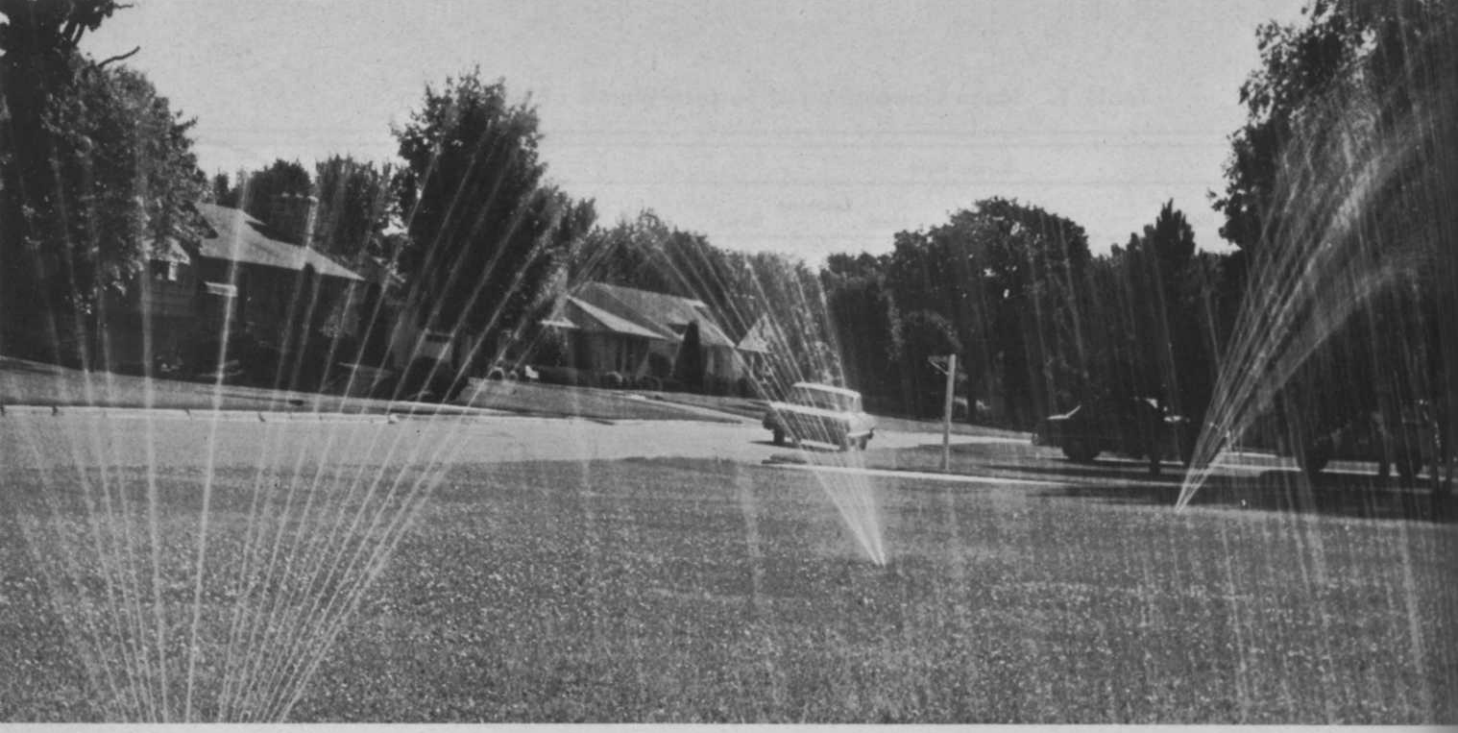

Small neighborhood park is being irrigated with an efficient wave-type sprinkling system. (Its control box is shown below.)

Design Is Key For Effective

Small Area Irrigation Systems

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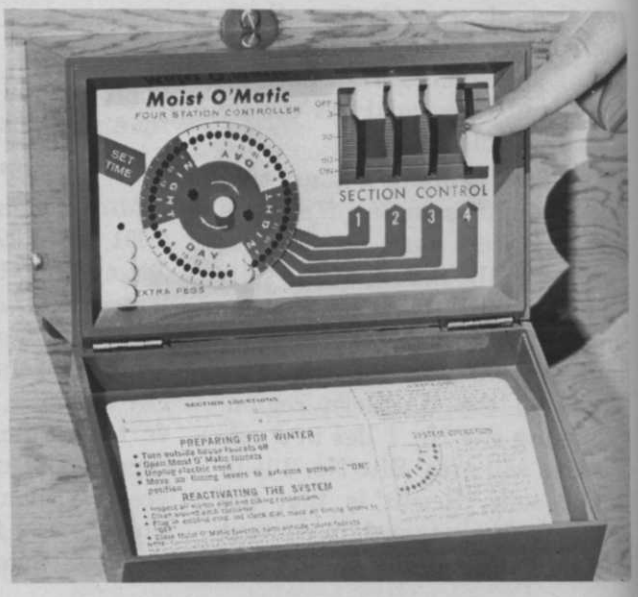
Careful balance and adjustment of many complex factors are needed to properly water turf. The basic requirements are the same, whether the area is small or large. Regardless of size, the soil conditions, demand of climates, and the physiological requirements of the plants must be considered.

There are, however, irrigation problems with small areas which are not always found on larger sites. Examples include: complexity of landscape patterns or designs; space limitations; concentrations of plants with widely different water requirements, and frequently, limited water supply; poor quality of water; inadequate pressure; and poor or restrictive distributive systems.

The need to water small areas effectively may well be more critical than on larger sites. For, in total, the small areas such as home lawns, industrial lawns, school playgrounds, small community parks, athletic fields, and, in some cases, intensively used sections of larger areas, constitute a very large part of the green and landscaped areas of our cities and towns. In this respect, they are valuable and necessary as well as functional and aesthetic. They constitute places to play and to relax. They filter the atmosphere of our communities. They enhance the beauty and the value of property. When properly landscaped, maintained, and groomed, such areas attract visitors and invite industry. Thus they become economically important.

For these reasons, watering systems for small areas merit careful study, evaluation and se-



Compact Four Station Controller box regulates the system illustrated above.

lection. They must be chosen on the basis of *efficient performance* which will result in production of high quality turf, shrubs, trees, and flowers, with a minimum use of water.

Conservation of water is a vital issue in many areas and will inevitably become so in all areas. Among the first requirements for a small area irrigation system, then, must be application of water in a manner which results in maximum conservation. This can occur only when a watering system has flexibility to: (1) apply water in a manner suitable to a wide range of plant and soil conditions; (2) provide for maintenance of good soil-air-water relationships; and (3) permit application of water in "off-peak" use periods.

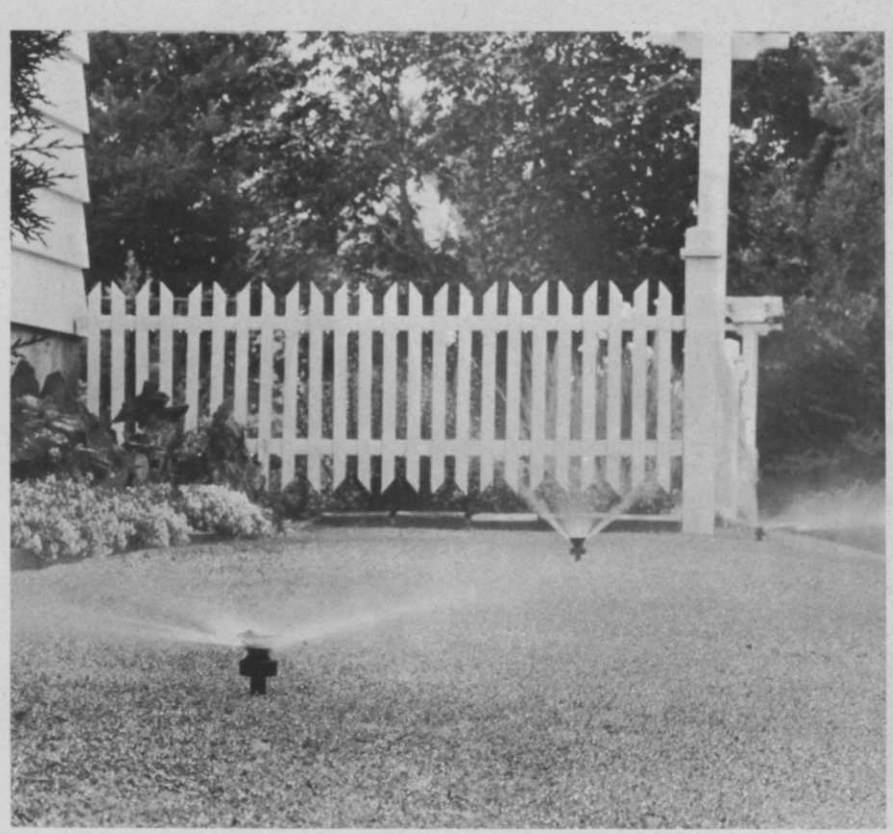
Amount of Water:

The amount of supplemental water required to keep lawns green and healthy throughout the growing season is dependent, principally, on temperature, sunlight, wind movement, and rainfall. For example, in the midwest, to sustain growth and to keep turfgrass green during the growing season, it has been calculated that supplemental water will have to be applied in varying amounts for 4 to 5 months, 65 to 75 percent of the growing season. This calculation is based on average weather data for the climatic regions for the midwest over a 30-year period.

Methods of Applying Water:

Techniques for applying water to small areas are flooding, sub-surface watering, and sprinkling. Flooding and subsurface irrigation are the least efficient from the standpoint of water distribution and use. These methods are seldom, if ever, used.

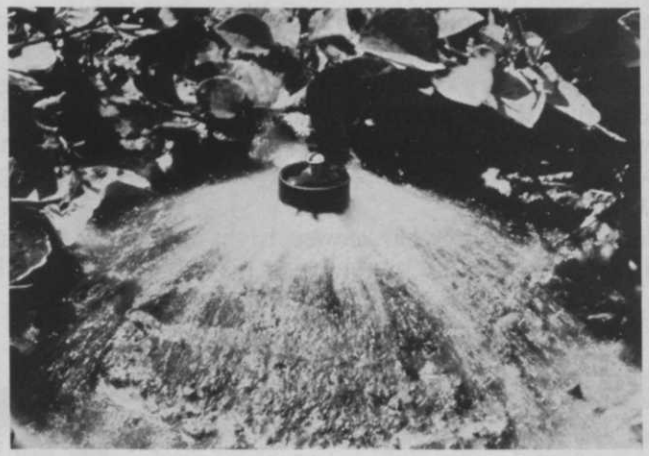
Hose-end devices, overhead (solid and portable), and underground sprinkler systems are the usual means of watering small areas. Of these, hose-end devices are, by far, the most generally used, especially on home lawns. Some hose-end sprinkling is done on larger areas, but most facilities such as athletic fields, industrial lawns, and small parks are watered by some type of underground system. Overhead systems are used for nurseries, sod farms and similar areas where a "crop" is involved and conventional cultivation is necessary. This type plays a minor role in the irrigation of small areas.



This pop-up sprinkler is excellent for watering small, complex areas.

Hose-end Sprinklers:

Hose-end sprinklers are available in many sizes, types, and prices. Such sprinklers often deliver water at rates faster than the soil can accept or absorb it, many times at a cloud-burst intensity of one inch or more per hour. Under such conditions, they need to be moved frequently. And, since this must be done by hand, there is a tendency to overwater and to waste water in runoff or in excessive percolation on well drained soils (movement of water through the soil profile). Also, little distinction is made between shady and sunny, or high and low areas. In addition to the inefficiency and inconvenience asso-



Bubbler sprinklers allow roots to be watered without wetting the plants' leaves.

This pop-up sprinkler is directing water away from the leaves.

ciated with many hose-end sprinklers, labor costs (or time on the part of the worker or homeowner) are greater and the devices must be used, generally, during peak-use periods.

Underground Sprinkler Systems:

These are pre-planned for complete coverage of an area. When properly designed, installed, operated, and serviced, they are the most efficient way to irrigate. Underground systems may be of the quick-coupling or of the fixed-head type. They may be operated manually or by a pre-set clock similar to a clock-radio or an oven. (When quick-coupling systems are actuated and turned off—controlled—with a controller, they are called "semi-automatic").

If reliable, well trained manpower is available, the job of applying water to small areas can be accomplished with a quick-coupling or a clock-controlled automatic system, or even with a hose-end sprinkler. However, since such operators are rarely available, there is little doubt that the most effective, efficient, convenient, and economical way to water both small areas and large areas is by automatic underground sprinklers. Clock-controlled systems are flexible and constant. They are always on duty and available on demand. They prevent waste.

Automatic Systems:

There has been marked progress in the development of equipment to permit automatic watering of turfgrass and other landscaped areas within the past few years. Equipment presently available permits the controlled application of precise amounts of water. Further, such systems are capable of delivering the water in accordance with the needs of grass, trees, shrubs and flowers in conformance with the ability of a given soil to take it (infiltration capacity) and to store it (watering-holding capacity). Most important, systems today are economical and assure conservation of water with minimal operating cost.

Numerous advances in controllers, valves, and sprinklers have occurred within the past few years. Thus it is well to keep in mind that any system, old or new, irrespective of how well it has been installed, used, and maintained can be no better than its basic design.

Design:

Good system design and hence good performance have to start with the specifications laid down by the owner or his representative, preferably, someone with knowledge of turfgrass requirements. He must specify what he wants the system to do.

Basically, any system design is a compromise between cost and performance. Thus, the owner (or operator, or turfgrass manager) must make certain basic decisions, all of which revolve around obtaining the best performance for the costs involved.

Design of a system starts with the owner, operator, or turfgrass manager answering such questions as: area to be covered, hours available for watering, amount of water to be applied, type of system, precipitation rate, wind velocity, and service life of the equipment. Answers to these questions, once incorporated into the system design, are fixed.

The area to be covered or watered must be determined, preferably by use of an accurate plot plan. There will be no embarrassing questions later if this is scaled and laid out in advance.

On large areas like golf courses and parks, when the time available or allowable to apply a specified amount of water is limited or restricted, the cost will be substantially affected. This may also be a factor on small areas and is one reason that a competent irrigation specialist should be con-

A shrub sprinkler irrigates this vegetable garden.

sulted on system design for small as well as large areas.

A system is purchased to water grass and to keep it green during the growing season. This often coincides with the driest time of the year. Failure to specify a system large enough to provide adequate water will produce trouble for all concerned.

Wind Condition:

The importance of wind is often over-looked. Performance of various pop-up heads varies only slightly. So, a standard spacing chart may be of use as a guide.

Standard Spacing Chart for Pop-up Heads

Wind Velocity Miles Per Hour	Maximum Triangular Spacing (Percent of Diameter)
0- 3	70
3- 5	60
5- 7	50
7-10	40

The number of heads required for effective watering goes up in inverse proportion to the square of spacing. Therefore, 3 times as many heads would be required in an 8 to 10 mile-per-hour wind as are required in a 0 to 3 mph wind. Substantial savings may be affected by scheduling watering periods to coincide with time periods when wind is low.

These factors plus information on the maximum precipitation rate allowable and uniformity of precipitation and service life (durability) of the various component parts are critical to proper design. They must be specified by the owner or his representative.

Once these decisions are made and turned over to a sprinkler system designer, a system to meet your specifications may be designed. Do not fall into the trap of ignoring such specifications; or of relying on some well-meaning friend who tells you that you should use only X pipes, Y heads, and Z controls and valves. They may be perfectly good but not compatible with the needs of your turfgrass area. Failure to specify the basic requirements for a given system has resulted in unsatisfactory performance of many systems, both automatic and manual. One further advantage of specifying is that responsibility for performance is easily assigned to the designer. Specify the area, the hours, the amount of water, type of system, maximum wind and precipitation, and service life.

Summary:

To use water properly requires an understanding of the fundamental role water plays in plant growth; of the effects climate and weather have on growth rates; how they influence water-use rates and choice of grass or plant materials. Good watering practices demand a knowledge of the basic physical and chemical soil properties, how they affect water absorption, storage and drainage as well as the frequency, rate and manner in which water must be applied.

Small area irrigation requirements are similar in principle to those of large areas. They have the same basic function but may need to be more precise because of the complexity of landscape. The role of small area irrigation is important because of the impact that small areas, in total, have on the aesthetic and economic life of a community.

Small area irrigation systems must perform efficiently and effectively. They must permit maximum conservation of water and they should be economical to operate. They should be designed by a specialist, installed properly, and serviced routinely.

Clock-controlled (automatic) underground sprinkler systems provide the best answer to the problems associated with irrigation of small areas. Their flexibility permits correct watering despite the varied conditions that exist on small areas. Also, they are economical to operate and they conserve water.