OVERHEAD WATERING OF CONTAINERS

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INTRODUCTION

Greenleaf Nursery Co. is headquartered approximately 70 miles southeast of Tulsa and has a new division in Texas about 70 miles southwest of Houston. Both nurseries are exclusively producing container grown ornamentals, growing both conifer and broadleaved evergreens, trees and shrubs. The practical aspects of overhead watering presented in this paper will be those gained from past experience at the Oklahoma site but will to an extent apply to both areas.

There are a number of factors affecting our particular situation that should be kept in mind when considering our method of ırrigation. First, there is as much as 125° variation in our temperature, ranging from -15° F to 110° F. This forces us to use two differing overhead systems from season to season since we must overwinter our stock. Secondly, our growing season lasts from April to mid-October. Third, there are approximately 100 acres of container stock that is exclusively overhead watered unless problem areas arise. Probably most important is the fact that we have an almost unsurpassed source of water from Lake Tenkiller. The water has a conductivity of 0.19 millimhos / cm and thus presents no salinity problems in itself.

EQUIPMENT

We are presently using two 60 h.p. Berkeley electric pumps that have a combined capacity of 1,500 gal / min. There is also a standby propane powered Hale pump that is used in the event of a power failure or problems with one of the electric units. By this spring the pumping system will be expanded to include three electric pumps and a larger standby unit.

The pumps push the water through an 8'' aluminum line up the hill from the lake to the container area. The mainline is divided into three seperate sections so that each section can be isolated and repaired without shutting the water down on the other sections. This feature is of great importance during our extremely hot summer days when a shut down of the whole system for 6 hours could be disastrous.

The irrigation lines going to each block are 4'' aluminum lines in 40' lengths. A 4'' gate valve controls the flow to each block from the mainline. The block themselves are set up so that the Rainbird sprinklers are at the corners of a 40' x 42' rectangle. This represents a minor imperfection, but the 42' is the lateral 1'' line and is used for simplicity's sake since it represents two standard 21' joints of

galvanized pipe.

At the end of the 42' lateral line is a "T". One leg of the "T" goes to a 3/4" faucet or hose bib and the other leg holds the 3/4" riser. The faucets are placed on each lateral line as a source of water at planting time so that a hose can be attached to thoroughly hand water everything after planting. They also serve as the means for draining the lateral lines of water during the winter in order to keep the lateral from bursting.

Atop the riser is a ½" gas valve and the Rainbird sprinkler. The gas valves have been in use only about 2 years at Greenleaf. They have proved very worthwhile despite their cost of almost $1.00 apiece. Their uses are practically limitless. They are used to shut off the water to a Rainbird so that it can be removed and unstopped without turning off the entire block or getting soaked. They are also useful in controlling the water in an area that needs to be run drier. The area can be run for a short time and then turned off while the remainder of the block continues to run. They are useful for turning off a riser for short periods of time if a shipping crew needs to pull an order off a block on which the water is running.

The Rainbirds we use are generally of three different types. Our standard is the No. 20 full circle with an 11/64" orifice with screw adjustment. We use this model and orifice in our normal summer watering. On certain varieties of trees that require more water we will use a 7/32" orifice. The others presently in use are the No. 20 with a stainless steel deflector, which is used in the overwintering houses to obtain good coverage at the base of the "A" Frame; and the No. 35 part circle which is used to control water in problem areas. The No. 35 is installed to control water in The No. 35 is installed at a point so that by adjusting the arc of its circle the water can be withheld from an area that is too wet. Used in conjuction with the quarter turn shut off's this can be very effective in drying an overwet area.

When all this equipment is functioning properly together we will be running approximately 1,500 gal/min with a pressure of 35 psi at the sprinkler head. The flow will be almost 5 gal/min per head with an 11/64" orifice or a rainfall equivalent of 0.3 inches per hour.

SEASONAL WATERING

During the hot summer months the irrigation pumps are usually turned on at 6:00 a.m. A typical watering schedule would then be carried through the day as follows:

First, the saleable sized conifer either in 1, 2, or 5 gallon size that is susceptible to *Phomopsis* twig blight is watered. This practice is done so that these plants will not have wet foliage overnight, thus eliminating the damp conditions that encourage the twig blight. After about 2 hours another set of saleable age conifer and possibly

a block or two with hollies are run. By 11:00 a.m. the time has come that we have to begin watering trees, pyracantha, and some deciduous shrubs. The middle of the day is then completely occupied with watering these items. Later in the afternoon the young conifers are watered along with some of the young hollies and trees that require little daily water. The early evening sees the water returned to the large trees. The rest of the day's watering allows the waterman to rewater any items that may be running drier. The pumps will then be turned off at about 9:00 p.m.

This schedule allows us to water every plant on the nursery once daily for 1 to 4 hours depending on its needs. This does not mean to say that we indiscriminately water everything on the nursery whether it needs it or not. The watermen will be checking the soil moisture content at different points on a block from one to two times daily. Therefore, they will determine the amount of time required to bring the soil to optimum moisture content and water that block accordingly. We are constantly striving to avoid overwet conditions as well as dry. The overwet condition leads to excessive leaching, retarded root growth, and an increase in root diseases.

The whole basis of our system is based upon constant checking of the soil moisture level. This cannot be stressed too much. Probably as much as one half of our watermen's time is spent in checking the moisture level in the containers. Experience has shown that you can not play "catch-up" with overhead watering during our hot summers. Therefore we feel the time spent in checking moisture is well invested.

Fall is a transition period when the main problem is to begin to harden the plants off by first withdrawing the fertilizer and then decreasing the amount of water available so the plant will be hardened off to tolerate the winter temperatures.

It is also at this time of year that we build our overwintering houses and thus the plumbing setup on the irrigation system must be changed to fit the "A" frame houses. The change is a very simple one and requires approximately 8 man hours to completely convert a block to four overwintering houses. The center risers on the 4" line are removed and an elbow and tee replace the collar between the two joints of pipe in the lateral 1" lines. An extra riser is then placed in this tee so that the system now has two rows of risers parallel to the 4" line at a distance of 21' on each side of it. The spacing from riser to riser down the aisle of the house is now alternately 19' and 21'.

Once the deflectors are installed in place of the regular orifice in the Rainbird, the irrigation system is ready for winter.

During the winter much of the overhead irrigation done is for thawing purposes. This is due to the fact that the changes in tem-

perature in our area are sometimes quite drastic. One day might see the temperature hover between -5° F and 0° F and the next day will have bright sunshine and 55° F. Therefore we put as our first priority the thawing of the soil in any containers that might be frozen. We also want to keep a fairly good moisture content in the can after thawing because of the tendency of the soil to dry with each freeze.

Our normal winter watering will be done almost any day that the temperature is above 35° F. Most of the plant material outside the overwintering houses will have to be watered once a week. That inside the houses will be watered twice a week if necessary. Once again, this is not a rigid schedule, but is based solely on plant needs.

During the winter the total irrigation system must be drained every time it is used. All pumps, the mainline, 4'' lines, and lateral lines are drained after each use to prevent freezing. We are lucky to have gently sloping terrain so that gravity will do much of the work of draining the system.

ADVANTAGES OF OVERHEAD WATERING

1. Overhead watering cools the plant foliage and decreases the amount of wilt on the plants during hot weather.
2. Tremendous savings in labor over handwatering.
3. Less maintenance with solid set irrigation system than with plastic ''spaghetti'' system. Also our system of over-wintering and the rabbit population would make a ''spaghetti'' system useless.
4. Can be used for frost protection in the event of an early frost before our tender items are overwintered.
5. Keeps dust down on the roads and off the plant material.
6. When the water is running the whole system is easily checked by routine visual inspection.

DISADVANTAGES OF OVERHEAD WATERING

1. Can cause an increase in foliar diseases.
2. Daily overhead watering makes it extremely difficult to carry on an effective pesticide spray program.
3. There is a tremendous investment in irrigation equipment and plumbing supplies.
4. With so much water falling on the blocks, herbicide leaching is a problem which leads to difficulty in weed control.
5. There are problems with erosion from runoff on sloping ground.

6. Difficulty in coordinating work load and water schedule especially during warm weather and heavy shipping periods.

CONCLUSION

We feel that our overhead watering system is the backbone of our plant cultural program. The system is definitely not perfected, but so long as we can continue to produce the type of plants that we have in the past then it is by far the best system for our situation.

LARRY CARVILLE: Thank you, Dave, for taking us to Greenleaf Nurseries and showing us your system of watering. Our next speaker needs no introduction. He is our own Jim Wells, who is going to tell us about his experience with wetting agents and watering.

USE OF A WETTING AGENT TO HELP CONTROL THE APPLICATION AND USE OF WATER

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Good growers have always realized the vital role that water plays in their daily operation, but it is comparatively recently that we have come to know with some degree of certainty how water can affect a plant, can control its development and can change the final result substantially. This we now know to be true in every phase of plant growth.

Our main crop, of course, is rhododendrons, and we have always been aware of the need to control the frequency and quantity of water and to provide growing conditions which would allow surplus water to be removed as quickly as possible. This is true in field culture and even more important in container culture. The need for controlling the growing medium, whether it be in the field or in a can, to as close to field capacity as possible under wet conditions is, of course, based upon the effect of surplus water on the development of the rhododendron wilt disease, *Phytopthora cinnamomi.*

With the high temperatures which are almost inevitable in the growing medium in the can, the need for limiting the application of water and, when applied whether naturally or artificially, to bring