Recycling of Water in a Container Nursery

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INTRODUCTION

When I sat down to put this paper together, I asked myself: "What is it I want to get across to this group of propagators and growers?" I think the answer is:

- It can be done
- It is done
- It works
- It grows great plants
- It is economically feasible

So, I shall strive to do so.

BACKGROUND

Our nursery, Midwest Groundcovers, is a propagation and container nursery. It is located on the Western edge of the Chicago metropolitan area in northern Illinois. The climate is typically continental with hot summers and cold winters, so it would be much more like Moscow than Denmark or southern Sweden.

We grow groundcovers and perennials by the millions, but also large quantities of shrubs and evergreens. We are growers and wholesalers, and supply landscapers, garden centers, and nurseries in a six-state area in the Midwest of the United States. This area would be similar in size to Denmark, southern Norway and Sweden, and the northern half of Germany.

All propagation and growing is done in flats or containers using soilless media consisting of peat moss, sand, spent mushroom compost, perlite, and pine bark, in various formulations.

All fertilization is done by liquid injection through the irrigation water.

DISCUSSION

Our experience growing plants with recycled water really goes back to our early start on five acres (2 ha) of land. The land had a low area in the middle where the surrounding areas naturally drained. This low area was dug out and became our irrigation pond. We did have a well, but it was not big enough and considerable irrigation water was pumped from the pond. In those days we did not even know this was called recycling!

As we developed our main nursery a few miles away, we were more concerned about growing, selling, and surviving than with recycling.

About 10 years ago, when we started a new large expansion project, we were aware of recycling and problems caused by runoff in some areas of the country. We thought we should do something about runoff before the government told us it was necessary. At that this time greenhouse growers in Europe were utilizing totally enclosed recycling systems—the so-called ebb and flow systems and certain other types.

The dumbest thing many nurserymen have ever done was to think they were better or smarter than the greenhouse growers and that they should protect their

secrets. We tried not to be quite so bad and set out to learn from the greenhouse growers, and then developed the many modifications necessary for using their principles in an outdoor environment.

The following are a few basics in recycling:

- Reuse the excess irrigation water (what the plants did not utilize)
- Supplemental water and fertilizer
- A growing area with some type of water distribution system (sprinklers, nozzles, drip, subirrigation)
- Drain back of excess irrigation water and rain
- Reservoir to hold the drain-back water
- Pumping and water treatment facilities

We have two large systems in operation relying wholly or partly on recycled water: 1) Our north propagation facility and 2) Our Hickory container growing and sales facility

The north propagation facility has about 25 acres (11 ha) of mainly outdoor propagation in quonset structures and some indoor propagation in plastic houses with limited heat. In this facility we mass produce the bulk of our groundcovers—cuttings are stuck and rooted directly in the selling flats.

Misting is done with good quality water from a deep well that is acid treated to lower the pH.

All irrigation with fertilizer injected is done with recycled water. The mist and irrigation lines are inside the quonset house. A drain tile between adjacent houses directs the excess water to spillways and then back to the reservoir.

There are two water lines—one with clear water for misting and the other with recycled water (with fertilizer) for the irrigation. For 10 years this facility has produced millions of excellent groundcover plants with no more diseases or other problems than we had with well water.

Our Hickory container growing facility was started 5 years ago and now consists of 50 acres (22 ha) of container growing areas as well as sales yards and staging areas. The growing areas are mostly producing plants in 5-gal (14 litre) containers, and all are laid out with drip irrigation. Most areas also have overhead sprinkler capacity. In the container growing area drain back is also through drain tiles between the quonset houses and open spillways to the reservoirs. Storm sewers in the sales yard, staging, and road areas also lead back to the reservoirs.

Since the Hickory area has large elevation differences, a system of four diked reservoirs was constructed. The reservoirs are interconnected so all water moves down to the lowest reservoir and pumping station. These reservoirs have a capacity of about 8 million gal (30 million litre or 30,000 m^3). This capacity gives us the ability to irrigate for several weeks without rain or supplemental water. The pumping station has three separate units, one for each specific growing area. The system is not permanently pressurized. Each unit consists of a small pump (40 gal/min = 150 litre/min), a larger pump (300 gal/min = 1100 litre/min), a sand filter to take out particles, an acid injector, and a fertilizer injector. The acid injector system monitors the pH and injects concentrated sulfuric acid to keep the pH at about 6.1. The fertilizer injector, a DGT-Volmatic electronic injector (type ELB), measures the EC and adds fertilizer if there is not enough in the drain-back water. Recycling has substantially reduced fertilizer consumption to 25% to 50% of what non-recycling systems use.

If rainfall is not adequate, supplemental water is supplied to the reservoirs from wells or from a stream.

CONCLUSION

The concerns about diseases being spread and rampaging through growing areas when using recycled water has not materialized. No additional fungicide applications were made to those areas utilizing recycled water. High quality plants are produced in a more cost-effective way. The cost of building a production facility using recycled water is higher than that of a non-recycling facility, but not that much when it is planned and done from the beginning.

Substantial savings on fertilizer expenses are realized and many more plants can be grown without procuring additional water. Last, but not least, we are husbanding Mother Earth's limited resources much better, polluting much less, and, hopefully, keeping the environmental authorities away from our nurseries.