Introduction

Concerns over water quantity and quality have necessitated major changes in the way in which water is supplied to ornamental potted plants. Fueling these changes have been mandates by regulatory agencies that require either all or portions of the drainage water to be retained on the producer's property and to prevent it from leaching through the soil and into the ground water.
The major concern with drainage and irrigation runoff exists with the fertilizer salts that may be in the water and could potentially move into the groundwater supplies, rivers and lakes. Therefore, not only must water conservation be considered when designing an irrigation system, but the retention of drainage and unused irrigation water must also be planned. Because of the numerous modifications that can be made to any given design, it is not possible to discuss all types of systems that could be utilized in order to conserve and retain irrigation water. However, the concepts discussed and systems outlined in this publication provide the basis for developing such a system.

Basic considerations

When deciding upon the type of system to use, many factors must be considered, and the planning stage is critical. Crops being grown, types of containers in which the plants are to be grown, future expansion plans, quality of irrigation water and cost of the system versus value of the crops to be produced are all important factors to consider. For example, many seed trays and flats do not have designs that allow the soil in the container to contact the surface of a watering mat. Therefore, a different system, such as ebb-and-flow, would be better than a mat. Plants that are particularly sensitive to high soluble salt levels should be grown in a self-contained system in which water can be collected and recycled in case leaching is necessary.

Fertilization practices must be adjusted when using no-runoff watering systems. Since leaching is not desired, regular flushing of fertilizer salts will not occur. In subirrigation systems, water moves from the bottom to the top of the pot. Therefore, fertilizer levels and placement must be adjusted to match the plant requirements, the irrigation system and management practices. Further, watering frequency and volume will need to be adjusted since water is not being lost through the bottom of the pot.

A water test should be conducted to determine the total soluble salt content, pH, and bicarbonate level (often referred to as alkalinity) of the water. Because leaching is not routinely conducted with no-runoff systems, these variables must be controlled to a much greater extent than is necessary with overhead irrigation systems.

Some of the most common water quality problems encountered in Florida include high pH, high bicarbonate and carbonate levels, high soluble salts, microorganisms (bacteria, algae and fungi), sulfur, iron and sand or other suspended materials. If the water pH or bicarbonate and carbonate levels are too high, acid injection into the irrigation system may be necessary. The major effect that high bicarbonates and carbonates will have in producing potted plants is that they neutralize soil acidity which tends to increase soil pH over time. Generally the recommended range for bicarbonates and carbonates (reported as mg $CaCO_3$/liter or ppm $CaCO_3$) in the irrigation water is 60 - 100 for plug production, 80 - 120 for small pots and flats, 100 - 140 for 4- to 5-inch pots and 120 - 200 for 6-inch and larger pot sizes. These numbers should only be used as a guide since the plant being produced, fertilizer type and the growing medium are all important in determining the optimal range.
If acid injection is necessary, all parts of the system must be compatible with the injected material. Often it is best to have acid injected separately from any fertilizer. Because each irrigation system and water source may be different, the water should be titrated in order to determine how much acid is required to obtain the desired water pH and alkalinity level.

If the irrigation water is high in soluble salts, the water may need to be blended with water from another source that has a lower salt level. Salts may present a problem because of accumulation in the growing media and subsequent damage to plants or they may create operational problems for the irrigation system since, through precipitation, they can build up and create clogging problems.

Algae and bacteria may be a problem by growing and accumulating within the irrigation system and causing clogging. In addition some bacteria and fungi present in the water may be plant pathogens. Only opaque pipes, or translucent pipes coated with an opaque paint, should be used in constructing the irrigation system so that light required for algae growth does not penetrate the pipe. Both liquid sodium hypochlorite and Agribrom are labeled for