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By John W. Bartok Jr.

Consider surface water as an alternate source for irrigation

Rivers, streams and ponds are an alternate source of irrigation water to wells or a municipal system. They can be less expensive to develop than a well or municipal supply but generally have more problems in water quality and quantity.

Quantity of water

Surface water sources are dependent on runoff from adjacent land or from ground water springs. The quantity of water available varies from year to year depending on rainfall rates. Rainfall rates are highest during the rainy season which in most states is in the spring. During the late spring, summer and early fall when irrigation needs are the greatest the rainfall rate is usually lower.

If available, check water flow rates, flooding and maximum height for a river or stream to determine if it will supply the quantity of water needed. If this is not available, a check with the local National Resources Conservation Service (www.nrcs.usda.gov) office or town officials may provide some indication of what water is available. The water supply from a pond is more difficult to assess as it is subject to runoff from adjacent land or springs as well as evaporation and leakage.

Water flow, use rates

A common method of determining water flow from a stream or outlet from a pond is to multiply the average speed of flow (feet per minute) x the cross-sectional area (square feet) x 7.48 gallons per cubic feet = gallons per minute.

For example: a brook with an average stream flow rate of 50 feet per minute and 2 square feet of cross-section will have a flow of 748 gallons per minute (50 feet per minute x 2 square feet x 7.48 gallons per cubic feet = 748 gallons per minute). A weir can be used to more accurately determine cross-section area.

Greenhouse water use rates are related to transpiration and evaporation. For most areas of the United States a maximum water use rate is about 0.4 inches per day on the warm-

est days. This translates into about 0.25 gallons per square feet per day of growing area.

In greenhouses, use rates can exceed this at times depending on air movement, container size and color and temperature that the greenhouse is operated. I usually use a value of 0.3-0.4 gallons per square foot of growing area when designing an irrigation system.

Water quality

Surface water is subject to contamination from a number of sources such as sediment, chemicals and plant growth. These may need to be removed to make the water usable in an irrigation system. Tests for total suspended solids, volatile suspended solids, total dissolved solids, pH, conductivity and some of the key elements should be a first step in evaluating a surface water source.

Sediment

Suspended particles such as, soil, clay and sand in runoff from adjacent agricultural land, construction sites and bank erosion can affect the operation of pumps, piping and nozzles. High levels of particles can reduce the life of pumps and clog sprinklers. Water samples taken at different times of the year and after a heavy rainfall can help to determine the concentration of suspended solids.

The type and size of filters needed will vary with the size and amount of particulates and the type of irrigation nozzles used. Multiple filters may be required. A common filter for dirty water is the self-flushing type. When the pressure difference between the intake and exit is above a certain level, the filter will be flushed. A unit with multiple filters that flush independently will allow a pump system to operate continuously.

Algae and bacteria

High light levels and temperatures along with carbon dioxide, nitrogen, phosphorus and trace elements influence the development of algae. A pump or compressor aerator that cir-

culates the water and introduces oxygen may be needed in a water source such as a pond. Recently wind and solar powered aerators have become available.

Slime caused by bacteria can clog irrigation systems. Growth of these may be from hydrogen sulfides, iron bacteria or manganese present in the water.

Animal organisms

Protozoans, zooplanktons, small crustaceans and fish can create blockages in irrigation pipes and nozzles. Water fleas and water mites may also be present at certain times of the year. Filtration is needed.

Chemical sediments

Surface water is likely to have the presence of chemicals from runoff of adjacent fields or from illegal industrial waste. It is also possible to have harmful quantities of chemicals such as chlorine, boron and other salts that are found nat-

urally in the soil.

One of the most common pollutants found in streams is high nitrate levels from manure application and fertilizer used on dairy farms. It is also possible to have water that has a harmful level of herbicides from agricultural fields near the stream.

Water source location


The distance and elevation of the water source in relation to the greenhouse should be considered. The amount of trenching needed and the location of the pump can add to the cost of the installation. You should know the total cost of pumping water before you decide if the source is viable.

Equipment maintenance and water source also add to the cost. Fencing may be needed to keep animals and children out. The dam on a pond will require mowing and cleaning of overflow pipes.

A buffer may have to be installed to filter out sediment and pollutants.

Water diversion regulations

Water right laws have been passed in many states that limit the amount of water that can be used. In Connecticut digging a pond does not require a state permit, but taking out more than 50,000 gallons a day does require a permit. A dam below grade may not require a construction permit, but an above ground one does.

Local wetlands commission approval is usually required. An application for a diversion is expensive and may take up to a year to obtain. Annual reports of water usage are required. 

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