Let's Think Out of the Pot

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INTRODUCTION

Environmental issues are always on the front burner when dealing with the production of ornamental crops. Issues such as water quality, runoff water, fertilizer leaching, pesticide movement, and others are paramount at production facilities. As nursery producers, we need to think out of the pot – instead of thinking about making plants grow 95 miles an hour — think about what is taking place out of the pot with leachate and runoff from production beds.

In the last few years, there has been a lot of research concerning container leachate, how to maximize controlled-release fertilizers, and utilization of cyclic irrigation for reducing runoff from production pads to minimize production practices that affect the environment. Many of you have been operating with Best Management Practices (BMPs) for many years or have implemented BMPs in the past few years to decrease or eliminate irrigation runoff from production facilities.

CLEAN WATER ACTS OF 1972, 1977, AND 1987

Regulatory agencies have been reevaluating the Clean Water Acts of 1972, 1977, and 1987. These acts were designed to protect surface and ground waters. Section 303(d) of the Clean Water Act provides for: 1) identification of water for which technology-based effluent limitations are not stringent enough to implement water quality standards, 2) a priority ranking for water quality segments, and 3) establishment of total maximum daily loads (TMDL) for pollutants.

Many of the watersheds in each state have been monitored for the impact of agriculture and other pollutant sources. Each watershed has an identification number, the impacted water body, the pollutant cause, the pollutant source, the magnitude of the impact, and finally whether a TMDL has been assessed. A TMDL is the total maximum daily load that is approved for a particular water body. TMDL is defined as the sum of nonpoint sources plus the sum of point sources plus a margin of safety. Nonpoint source is defined as any source of pollutant that enters a water body from no particular point. For example, flow from a pasture or runoff from paved areas is considered nonpoint source pollution. A point source is described as a discrete discharge through a pipe or similar conveyance. The margin of safety accounts for uncertainty in the loading calculation that water can receive without violating water quality standards. TMDLs for watersheds in your state are available on the U.S. EPA web site (www.epa.gov).

The U.S. EPA is using a term "impairment" as a collective term for pollutants in the water that reduce water quality, such as nutrients. A specific nutrient, phosphorus, would be an example of a pollutant. In Tennessee, there are 35 different types of impairments. Some examples include siltation, pathogens, nutrients, pesticides, and oil and grease. The top 5 sources of impairments are agriculture 15%, channelization 11%, urban runoff 11%, land development 7%, and contaminated sediment 5%.

A priority level, low or high, is recommended for developing TMDLs in each watershed. The priority level is dependent on the amount and type of impairment. In many watersheds, sediment caused by soil erosion is the primary impairment. Soil erosion can be a severe problem from moving soil particles, but also in that nutrients and pesticides can adhere to the moving soil particles. In some areas, nutrients were listed as a primary impairment, in which agriculture is listed as the cause of the nonpoint source pollutant.

NITROGEN AND PHOSPHORUS

Two nutrients of concern to nursery producers are nitrogen and phosphorus. Nitrogen, in the form of nitrate, has been a health concern in potable water for over 50 years. The maximum contaminate level of nitrate-N is set at 10 ppm, or nitrate levels at 44 ppm. As a BMP, we have recommended sampling irrigation waters, irrigation runoff, and holding ponds to document nitrate-N levels at different times during the production cycle. Another approach is to develop a nutrient management plan (NMP). This includes not only nitrogen, but also phosphorus and potassium. It will be important to maintain records for levels of nitrate-N in runoff water, and documentation of how many pounds of nitrogen and phosphorus are used per unit area. Currently, as producers we are familiar with pounds of fertilizer per cubic yard, not pounds of fertilizer per greenhouse or surface growing area [m^2 (yd^2)]. This information helps to determine the potential for nutrient loading of surface and ground water.

Phosphorus, in the form of phosphate, is targeted for environmental concerns due to the phosphorus activity in water. Phosphorus is the most limiting element in water, while nitrogen is the most limiting element in plant growth. Phosphates can enter bodies of water in runoff water, soil particles, and plant debris. High levels of phosphates cause algae blooms and are a health concern for fish and other aquatic life. This in turn can cause irrigation pump damage or clogging of irrigation emitters. Phosphorus at 1 ppm or phosphates at 3 ppm are considered high levels, but the maximum contaminant level for drinking water is not defined.

IMPLEMENT BEST MANAGEMENT PRACTICES

A nutrient management plan (NMP) for your production facility is a BMP to implement and meet environmental concerns. A nutrient management plan can be defined as irrigation management plus fertilizer application. The first step in developing a plan is to get an overview of the production facility. Your county U.S.D.A. Farm Services Agency (the old ASCS) should have aerial photographs of your land. Some of the photos are out dated and a new aerial photograph may be needed. Identify the growing area, the location of stored chemicals and fertilizers, and potential runoff sites. Locate streams, creeks, lakes, wetlands, and sinkholes in relation to your property. Mark and identify any areas where irrigation effluent enters lakes, streams, or any other body of water. Evaluate runoff potential from the production facility. If all the runoff is contained on site, then you will have fewer problems developing a NMP.

One of the ways to prevent irrigation waters from leaving production nurseries is to build ponds, also known as retention basins or abatement structures. This is one of the best BMPs to prevent irrigation water from leaving a nursery. The Natural Resources and Conservation Service (NRCS) has field representatives that can help

you determine the best location for ponds and waterways. They provide a valuable service in this area. Older nurseries may not be able to build ponds on existing properties, so other BMPs to reduce irrigation effluent are paramount.

Plant vegetative filter strips in drainage ditches between the production facility and waterways whether these waterways lead to holding ponds or funnel effluent into a public water source. The plants in the vegetative filter strip use some of the nutrients carried in the runoff water, prevent soil erosion, and play a role in degradation of pesticides. After a heavy storm, check the nursery to see if there is soil erosion or sediment movement from your property. NRSC can advise you on plants recommended for riparian areas.

Evaluate Your Irrigation System. Document irrigation volumes at different times during the growing season. Apply only the amount of water needed to grow the plants. Set rain gauges or cups in a block of plants to check the amount of water applied and the irrigation distribution during an irrigation event. If an irrigation sprinkler is not operating correctly, fix or replace it. Do not overwater the rest of the block of plants to compensate for a faulty sprinkler. Consider cyclic irrigation. It has proven to be a technique that requires less irrigation water, reduces leachate potential, and lowers nitrate-N levels in container leachate.

Develop a Fertilizer Budget. Make a computer spread sheet or worksheet to document the method of application and the schedule of application to plants. Keep accurate records of fertilizer use (and pesticide use) by blocks of plants, production houses, or specific nursery crops. Evaluate your use of fertilizers, such as controlled release and liquid, for the best plant growth and environmental concerns.

Calculate the Total Pounds of Fertilizer You Apply to the Production Facility Annually. How may pounds per acre of nitrogen and phosphorus are needed to produce quality nursery stock? Most of us do not think in terms of nitrogen per acre for container production. We are conditioned to think about pounds of controlled-release fertilizer per cubic yard or ppm of nitrogen for liquid feed. Future regulation on fertilizer use will require documentation of the total amount of a particular nutrient applied in a known area.

The U.S. EPA will allow individual states to manage water quality issues if states can show they are capable of preventing these contaminants from adversely affecting human health and the environment. So the interpretation of the regulations may differ from state to state. In Tennessee, a three-step program is proposed. The first step is to monitor to assess the water quality of streams and lakes and to document problem areas. The second step is to implement BMPs to reduce the impact of the problem. The third step is to educate producers as to the production techniques that cause the problem and solutions to minimize the environmental impact. As a last resort, if the impairment problem is not corrected, then regulatory agencies can suspend the use of that practice or chemical until the problem is corrected.

CONCLUSION

Finally, maintain a positive proactive approach – educate yourself and learn the lingo of the environmental issues. Most of the states are underfunded to support the policing of all the water quality concerns and regulatory action will be done on a complaint basis. Using recommended BMPs, irrigation effluent from container nurseries should not adulterate water quality standards.