



Despite being surrounded by 4 of the 5 Great Lakes, water is rapidly becoming one of the biggest production challenges for the ornamental plant and Christmas tree industries. Ten years ago, I would have discussed water availability and quality in relation to the chemical and biological properties that were likely to be encountered in irrigation water such as alkalinity, soluble salts, and aquatic organisms affecting irrigation systems. Plenty of good information exists about managing these problems. But with the increased use and competition for water resources, the water quality issues of the future are going to result from how water resources are used and managed by the industry and other use groups.



Michigan Water Security: Water Sources Considerations

TOM FERNANDEZ, PROFESSOR,
DEPARTMENT OF HORTICULTURE,
MICHIGAN STATE UNIVERSITY

Photos: Dutchman Tree Farms

The availability and quality of water have always been a consideration when selecting or expanding sites for irrigated agriculture. There are two primary sources of water for irrigation, industrial, commercial and residential needs: surface water (rivers, streams, lakes, ponds, reservoirs) and groundwater (surficial and bedrock aquifers). Municipal water can be considered another source but ultimately comes from surface water or

groundwater. As populations grow and urbanization continues, communities withdraw more water from current water resources. Agricultural and industrial water use is also expanding. In other words, more people are drinking from the same cup. Those resources are not growing, so the water in the cup is dropping. At the same time, higher quality water sources are being set aside for direct human use. This drives Christmas tree, nursery, and

greenhouse operations to locate further from urban centers, improve water use efficiency, and/or use alternative, sometimes lower quality water sources for irrigation.

Water rights in Michigan, as for most of the eastern US, are based on riparian and reasonable use. Basically, this means that a person or entity has rights to use a water resource if they own property that is in contact with that water resource but they cannot adversely



affect the use of that resource by others with rights to that resource. This applies to both surface water and groundwater. So, the amount of water available for use is related to the volume of water entering a water system (the recharge rate) and the amount of water that a user can extract from the system without affecting the use of others with water withdrawal rights. For example, you cannot install a well that drops the groundwater below the depth of the existing wells of others. Another example, if you own property on a lake or river you can extract water from that lake or river as long as it does not affect the reasonable use by others who own property on the lake or river. Use includes not only the ability to extract water but also recreational use: fishing, access by docks, boating, swimming, etc. To avoid these issues, in order to install a high capacity well (one or more cumulative withdrawals of more than 100,000 gallons per day in any 30 day consecutive period) or expand a current high capacity well field in Michigan, whether from surface water or groundwater, you must use the Michigan Water Withdrawal Assessment Tool (https://www.michigan.gov/egle/0,9429,7-135-3313_3684_45331_45335-477090--,00.html). This is also a great tool to use before you purchase a property where you intend to irrigate to ensure that you

can install a well sufficient to meet your needs. Michigan has many areas with more than sufficient water volume for Christmas tree and ornamental plant production but there are areas where the volume of water is insufficient for irrigation.

Surface water sources (rivers and lakes) often have good quality characteristics but, depending on upstream or adjacent users, can be degraded by pollution. Water use rights include more than just access to adequate water volume. The introduction of contaminants into water resources impairs the reasonable use rights of others. Contaminant sources are often difficult to identify so you should be aware of potential contaminant sources. It is also important not to become a source through runoff from production operations. Contaminants harmful to plants can come from other agricultural operations (pesticides, pathogens), industrial contamination, and leaking landfills to name a few. The difficulty with water contaminants is that they are often difficult and costly to remove. We are doing research at Michigan State University on inexpensive methods to remove agricultural contaminants from water.

Aquifer systems are comprised of more than one aquifer occurring in vertical layers, each having different water

quality characteristics. Aquifers are connected but usually separated by confining layers that drastically slow water movement. The different aquifer layers may be contained by different formations, for example limestone aquifers or basalt aquifers, that impart different properties to the water within those aquifers. Water moves through these aquifer systems and riparian and reasonable use applies to aquifers in the same manner as for surface water sources. Also, aquifer systems are ultimately connected to surface water systems and some are closely connected. Overextraction from an aquifer can affect flow rates of streams or depths of lakes, ponds and wetlands, especially in closely connected systems. Higher water extraction in an aquifer system can lead to the need for deeper wells that draw from lower aquifers. Drilling into another aquifer can result in different water quality since water quality is affected by the formations containing the aquifer. For example, moving from relatively shallow sand/gravel surficial aquifers into limestone aquifers can result in alkalinity problems. Several areas of Michigan have problems with iron, chloride, boron, and fluoride. Choosing sites with good water quality in several and deeper aquifers will improve future options for growers.

Most people don't think of salt as a problem in groundwater except in seacoast areas. However, 47 of the 50 US states have issues with salt water in groundwater. Michigan was at one time covered by seawater and high salts are a problem in some areas of Michigan, think of the former salt mines in the Thumb area and the still operating salt mine under Detroit. In the past, these areas were mainly near the lakeshores where the bedrock is close to the surface and ancient seawater was captured, but the problem has been spreading due to increased water extraction. Growers who in the past did not need to worry about soluble salt issues are starting to experience them. Seacoast areas are

familiar with the problem of saltwater intrusion from the sea into freshwater aquifers. Seacoasts are one of the main areas where competition is highest for water resources. In these areas, as more user groups extract more water faster than it can be recharged from upstream freshwater, seawater is drawn into the vacuum. This is no longer just a seacoast problem; saltwater intrusion problems have been reported in 22 inland states (there are 23 states with a seacoast). Salt water is denser than fresh water and settles toward the bottom portions of aquifers associated with former seas or areas with naturally high salt deposits. In some such aquifers with limited aquifer recharge and/or high-water extraction, water high in salts from deeper regions of the aquifer are being drawn upward to the zone of pump extraction and entering irrigation systems. Areas around Detroit, Muskegon, Montague-Whitehall, and areas of the Thumb have historically had issues with salt in groundwater, but more areas of Michigan are experiencing problems. Ottawa County is well known for a wide range of irrigated crops as well as being a fast-growing population center. Domestic and agricultural wells in Ottawa County have experienced both insufficient water volume and phytotoxic levels of salt in the water. This has recently even made it into the popular press, see this article in the Detroit News (<https://www.detroitnews.com/story/news/local/michigan/2022/02/26/michigan-water-shortage-great-lakes-pollution/49865395/>). There are at least another dozen Michigan counties with similar, if less extreme, reports. Runoff from irrigation pumped from aquifers with high soluble salts can enter surface water resources, so irrigators using surface water are not necessarily immune from this issue. However, it is rare that surface waters are significantly degraded in this manner.

Municipal water is a very high-quality water resource and is being used by

quite a few irrigated agriculture operations. However, it is of limited availability geographically and may also be limited in sufficient volume for irrigation depending on the municipality and size of the irrigated operation. Also, during times of drought, municipal water may be restricted or prioritized to human consumption.

While there are many challenges to future water security in Michigan there are also some easy to implement practices for growers that improve water use efficiency, allow use of lower quality water sources, and reduce adverse impacts to Michigan's water resources. We are also conducting research at MSU to improve irrigation practices and treat water cost-effectively to reduce agrichemical contaminants. Watch for future articles for a discussion of specific water quality issues and methods for improving water use and reducing contamination issues at your operation. 🌲

BERKEY'S NURSERY

*“Growers of
Genetically Superior
Evergreen
Seedlings and
Transplants”*

Go to our Website,
Write or Call for our
Complete Price List

44251 Rogers Rd. • PO Box 215
Spartansburg, PA 16434-0215

814-654-7513
Fax: 814-654-7503

www.berkeysnursery.com

All our plants are grown on fumigated ground!!!

Quality Stock • Competitive Prices • Dependable Service



**Growers of Top Quality Nursery Stock
and Christmas Trees for over 50 years**



- Seedlings and Transplants • Fir • Pine • Spruce • more!
- Nursery Stock is Fresh-dug for Spring Orders • Never Overwintered
- Michigan-grown Christmas Trees Planted On 5½'-6' × 6' Spacing Full Sides • Satisfied Customers

Please visit us at www.needlefastevergreens.com

Family owned
and operated
since 1956

4075 W. Hansen Road, Ludington, Michigan (MI) 49431
Toll Free: (877) 255-0535 or (231) 843-8524 • Fax: (231) 843-1887
Email: nickel@needlefastevergreens.com