

INFOSHEET #13

WATER EFFICIENCY

How to address concerns identified in your Environmental Farm Plan Worksheet #13



Based on
Environmental Farm
Plan Workbook,
4th ed. 2013

This infosheet outlines options to address concerns identified in your Environmental Farm Plan (EFP) as they relate to water efficiency.

All options are classed as **Actions**, **Compensating Factors** or **Monitoring**.

- **Actions** address the identified concern, and will change the EFP rating to (3) or Best (4).
- **Compensating Factors** are alternatives that will adequately address the concern, but will not change the rating in the EFP worksheet.

- **Monitoring** is an alternative in special circumstances only. When and how monitoring can be used is explained in the infosheet.

In most cases, you'll need more information before choosing and implementing options. Sources for more information are noted at the end of this infosheet.

For help with technical terms, please see the full glossary in your EFP Workbook.

MANAGEMENT

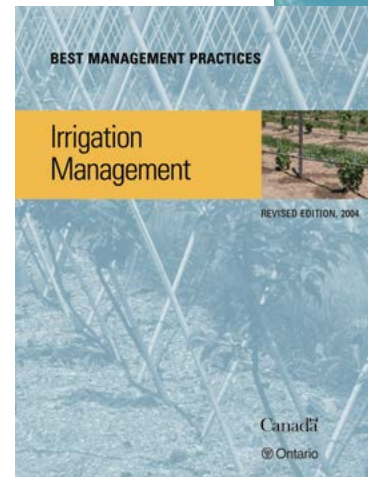
13-1. Knowledge of water use and supply system

BACKGROUND	WHAT CAN YOU DO?
<p>Water is a precious and limited resource. Using water more efficiently not only conserves water, but energy as well. It also generates less wastewater, and lowers potential for contaminants to move off your farm in surface or ground water.</p> <p>A good way to start is by monitoring your water use patterns to pinpoint activities that use the most water, and then compare these to industry standards.</p> <p>Understanding peak water uses and times can be helpful in the event of a water shortage. Priority water uses can be identified and emergency plans developed to handle any potential water shortages.</p>	<p>OPTION 1 – ACTION</p> <p>Regularly monitor water usage and compare to industry practices:</p> <ul style="list-style-type: none"> • calculate the volume of water used in your operation by measuring pump capacity and running time or by installing a water meter • log (record) volumes of water used for future comparisons and detection of leaks in the system • log volumes of water used for comparisons against industry practices. <p>OPTION 2 – ACTION</p> <p>Meter water, know the location of water lines and record them on a sketch.</p>



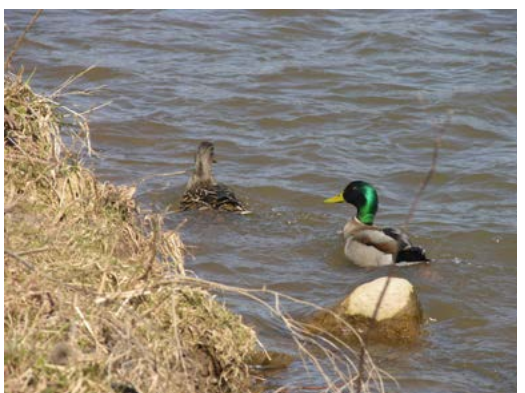
Pumps have flow characteristics that vary with pump rpm and operating pressure. A proper match of pump and motor will save dollars on maintenance and operation. For more information, see *BMP Irrigation Management*, page 69.

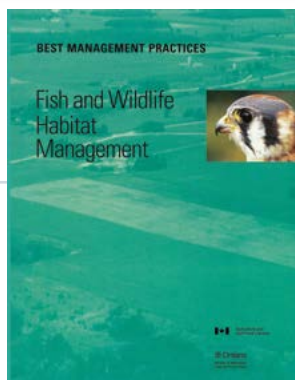
Regularly monitoring water usage and comparing to industry standards will be helpful in finding opportunities to reduce water use.



These BMP publications address water use in farm settings, and offer practical options to protect this valuable resource.

13–2. Impacts of water use on other water users, especially during periods of low water

BACKGROUND	WHAT CAN YOU DO?
<p>Water is a shared resource and it is important that we manage it to respect future users and natural systems. If you use more than your fair share of water, you risk diminishing the quantity of water available for users downstream or in the same aquifer.</p> <p>If your water taking requires you to obtain a Permit to Take Water, its terms and conditions will be determined based on your water needs, the available supply, and the needs of downstream users.</p> <p>Using water inefficiently in your household or barn may also affect water quality for other users, since more wastewater would be generated.</p> <p>Be aware if your water-taking is having a negative impact on other water sources.</p>	<p>OPTION 1 – ACTION – Ground Water</p> <p>Ensure your operation’s use of water is not adversely affecting water quality or quantity for other users, including natural systems:</p> <ul style="list-style-type: none"> • if your water-taking requires a Permit to Take Water, obtain a permit and ensure you comply with its terms and conditions, as well as the regulation that requires reporting of actual water-taking • determine whether your pumping ever reduces the ground water supply to the point that it affects water levels in neighbouring wells, etc. (see lower textbox on next page for tips) • speak with your neighbours to know if there are times when your water-taking reduces their water sources or natural systems on their property such as streams, ponds or wetlands • consider changing to a more sustainable water source and/or creating farm water storage in order to take water when supply is abundant • investigate the potential to access a sustainable water supply from off your farm, e.g. communal pipelines or sharing of water storage supplies • tailor your demand to existing supply (adopt efficient practices or technologies).
 <p>Taking large amounts of water from ground water can lower levels in wetlands, small streams and nearby wells.</p>	<p>OPTION 2 – ACTION – Surface Water</p> <p>Ensure your operation’s use of water is not adversely affecting water quality or quantity for other users, including natural systems:</p> <ul style="list-style-type: none"> • if your water-taking requires a Permit to Take Water, do so and then ensure you comply with its terms and conditions, as well as the regulation that requires reporting of actual water-taking • tailor your demand to existing supply (adopt efficient practices or technologies) • verify if your pumping ever reduces the surface water supply to the point that it affects water levels in creeks, rivers or ponds (see lower textbox on next page for tips) • speak with your local Conservation Authority about water levels in streams and potential periods of low water when it would be harmful to pump large amounts of water • install a staff gauge (a ruler) in the stream to see if the water levels decrease when you begin pumping – speak with your local Conservation Authority about installing a staff gauge or stream flow monitoring • consider changing to a more sustainable water source and/or creating farm water storage in order to take water when supply is abundant • use a pond (not connected to a stream) to store water for use when conditions are dry and usual water source is low or unavailable • investigate the potential to access a sustainable water supply from off your farm, e.g. communal pipelines or sharing of water storage supplies.



Healthy fish and wildlife habitat on rural property has many benefits, and most measures for improving habitat are compatible with production-related BMPs in a farm operation. See *Fish and Wildlife Habitat Management*, a BMP publication, for more information.

13-3. Permit to Take Water

BACKGROUND	WHAT CAN YOU DO?
<p>In order to withdraw more than 50,000 L of water a day (for irrigation or other farm uses such as washing produce or equipment), you are required to have a Permit to Take Water under the <i>Ontario Water Resources Act</i>. You must meet certain requirements in order to obtain and keep a permit. You will be required to know the estimated daily rate of water used, and the volume required.</p> <p>Most new permit applications must be accompanied by a study demonstrating that the proposed water-taking will not impact other water users or the natural environment.</p> <p>It is also important to keep detailed records of your water use so you can identify areas where you can improve your efficiency and to ensure you are operating within the parameters of your permit.</p>	<p>OPTION 1 – ACTION</p> <p>Obtain all required permits, keep a record of daily water use, and submit records:</p> <ul style="list-style-type: none"> • for all water-taking exceeding 50,000 L/day, the <i>Ontario Water Resources Act</i> requires you to obtain a Permit to Take Water from the Ontario Ministry of the Environment and Climate Change (MOECC) • a record of all water use can be used to verify against any permit issued • daily records of water-taking must be submitted annually to MOECC.

The 2015 amendments to the Water Taking Regulation (O. Reg. 387/04) add new regulations on water withdrawals of more than 379,000 litres of water per day where water is transferred from one Great Lakes watershed to another.

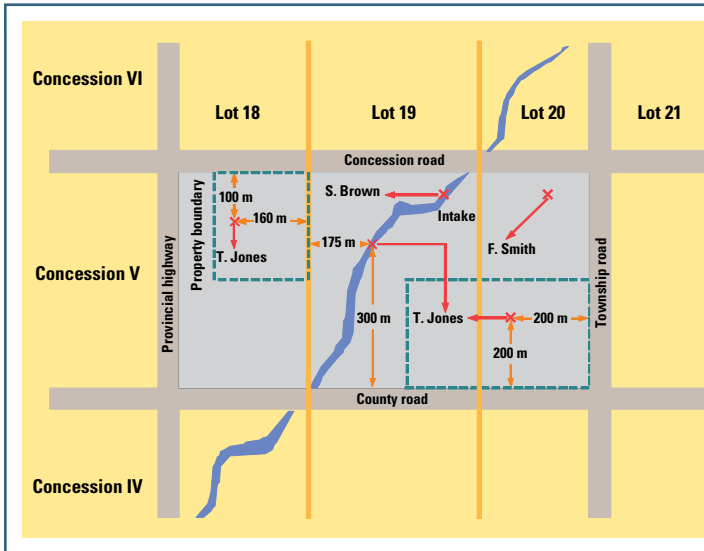
For such transfers, existing or new water takers are required to establish a baseline of water-taking with MOECC as part of the permitting process.

Large water withdrawals (more than 19 million litres per day) are subject to additional environmental requirements.

For details, see: www.ontario.ca/environment-and-energy/permits-takewater.

For more information about the Permit to Take Water and to download applications forms:

- see www.ontario.ca/environment-and-energy/permits-take-water
- call 1-877-344-2011.



Location maps for Permits to Take Water require general location (lot, concession, direction) as well as water supplies and wells within 0.5 km of your source of water.

The map, together with estimates of water-taking and supply, will help in the assessment of potential impact on neighbouring users.

To find out whether your pumping ever reduces surface or ground water supplies to the point that levels in neighbouring wells, streams, creeks, ponds, or wetlands are adversely affected:

- monitor water levels in local creeks, ponds or wetlands and wells
- test your use over a long period (e.g. 72 hours), and periodically measure the water levels in the nearby water sources
- talk to your neighbours
- consider hiring a hydrologist or hydrogeologist to determine the impact your water-taking.

13-4. Low water condition readiness

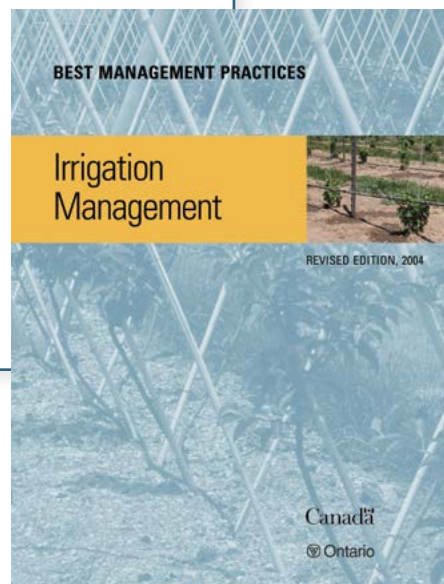
BACKGROUND	WHAT CAN YOU DO?
<p>Ontario Low Water Response (OLWR) is a strategy for local water users and those with an interest in water use to have input into the well-being of their community. Water Response Teams are established in areas experiencing low water conditions so that the local community can carry out actions to reduce and better manage water use. All water users are requested to share the limited water supply.</p> <p>By taking steps to make more efficient use of water, you will be helping to build up the resilience of your operation, and this can help see you through periods of drought.</p>	<p>OPTION 1 – ACTION</p> <p>Familiarize yourself with the Low Water Response Program:</p> <ul style="list-style-type: none"> • contact your local Conservation Authority • during dry periods, follow recommendations of your local Water Response Team to improve management of water during shortages • attend and participate in your local Water Response Team meetings. <p>OPTION 2 – ACTION</p> <p>Prepare a written contingency plan to deal with potential periods of low water.</p> <p>A written plan for reducing water use will help your business manage during times of shortage.</p>



Attend and participate in your local Water Response Team meetings.

See also this OMAFRA factsheet:

- *How to Prepare for Irrigation during Water Shortages*, Order no. 99-023



Water efficiency in irrigation systems has never been more important. Get the latest on scheduling strategies, the pros and cons of sprinkler, drip, and subirrigation systems, water-saving tips, and special applications from this comprehensive BMP publication.

LIVESTOCK WATERING

13–5. Maintenance of livestock watering equipment

BACKGROUND	WHAT CAN YOU DO?
<p>A reliable supply of water is one of the most essential components in a livestock feeding program. Livestock's demand for water will depend on many factors including time of day, temperature, species of animal, etc.</p> <p>Since the distribution system will tend to be the limiting factor, it is important to ensure the watering equipment has no leaks. Leaks waste water and money, reduce available water for livestock, and create more potentially contaminated wastewater.</p> <p>Leaks also contribute to wet and muddy yards, as well as the foot problems caused by livestock standing in wet conditions.</p>	<p>OPTION 1 – ACTION</p> <p>Monitor and maintain watering equipment regularly:</p> <ul style="list-style-type: none"> • inspect system regularly and repair any leaks as soon as they are discovered • ensure watering equipment is in good working order, and that floats and seals prevent spillage and overflows.



Ensure watering equipment is in good working order to prevent overflow and waste.

ON-FARM WASHING AND PROCESSING

13-6. Efficient use of washing/processing water

BACKGROUND	WHAT CAN YOU DO?
<p>Improving water use efficiency in on-farm processing will reduce farm water demand while achieving the same or better level of production. This will reduce the handling, storage and disposal costs associated with washing/processing water.</p> <p>Recycling water may be an option in some circumstances, but the food safety risks must be carefully managed.</p> <p>It is important to understand that it is an offence under the <i>Ontario Water Resources Act</i> to have washwater negatively impact surface or ground water. Washwaters, although not high in any particular contaminant, can still negatively impact stream water quality if the water has high suspended solids or biological oxygen demand (BOD). The higher the BOD of the material, the lower the oxygen level available in the water for fish and other organisms to survive.</p> <p>Ensuring that washing/processing water is properly managed is part of a good business plan and will help protect water quality around your farm. Contact Ontario Ministry of the Environment and Climate Change for more information.</p> <p>See www.ontario.ca/ministry-environment.</p>	<p>OPTION 1 – ACTION</p> <p>Analyze your operation, or hire a professional to analyze your operation, for the areas where water losses could be eliminated or reduced:</p> <ul style="list-style-type: none">• consider hiring a professional to perform the analysis• systematically review where all water is used in the process• implement all upgrades/improvements identified in review process• look for opportunities to treat and recycle wash water where possible to reduce the overall amount used.



Improving water use efficiency in on-farm processing will save water and money.

IRRIGATION

13-7. Irrigation scheduling

BACKGROUND

Irrigation may be a cost-effective technique to ensure there is sufficient available water to meet the crop's needs when natural rainfall is inadequate. Water application should be based on specific crop recommendations as well as personal knowledge and experience. It should also be adjusted according to climate, soil texture and daily weather. This is called *irrigation scheduling*. Adjusting irrigation to fit your individual crop's needs ensures that water is not wasted and that the crops will be of the highest possible quality and yield.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Use irrigation scheduling methods to maximize crop benefits and conserve water use:

- develop a plan for irrigating using recommendations for a specific crop's water needs, taking into account factors such as rainfall, evapotranspiration, stage of crop development and soil moisture (use a soil moisture meter to measure)
- implement plan.

See also this OMAFRA factsheet:
 • *Monitoring Soil Moisture to Improve Irrigation Decisions*, Order no. 11-037



Soil moisture levels are an important factor in assessing current conditions to determine when irrigation is needed to meet a crop's water requirements.

13-8. Water application

BACKGROUND

It is important that the irrigation system is delivering water at the appropriate rate for infiltration.

Observe cropland to ensure there is no irrigation-related ponding, runoff or tile drain flow: these are signs that your application rate is exceeding the infiltration rate.

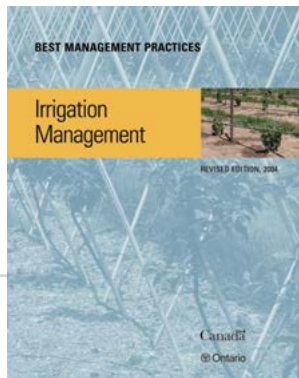
To lower application rate, you can reduce the density of sprinklers or change the sprinklers or nozzles for lower flow rates. Hilly areas of the field require greater attention for runoff management.

WHAT CAN YOU DO?

OPTION 1 – ACTION

Verify that the irrigation system is delivering the volume of water needed at the appropriate rate. Adjust the system and the system's operation to match the water needs:

- use rain gauges or catch cans located strategically across the field to measure and then log the actual depth (and volume) of water applied to the crop and the evenness of application
- improve uniformity of water application by:
 - changing the type of equipment
 - choosing to irrigate when winds are low
 - modifying the operating pressure
 - improving maintenance
- reduce water depth (volume) applied or the frequency of irrigation if tile drains flow as a result of the irrigation applications
- reduce application rate to avoid ponding and/or runoff – match application rate to infiltration ability of the soil.



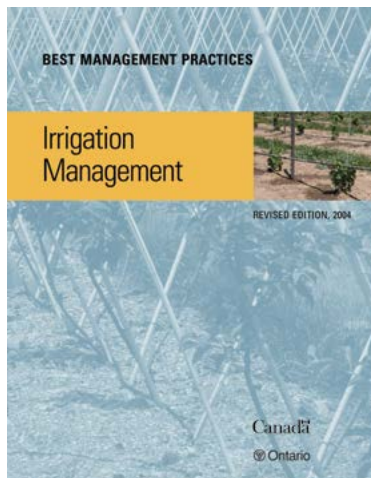
For more information about scheduling and verifying rates, see pages 24-47 of this BMP publication.



Use rain gauges or catch cans located strategically across the field to measure the actual depth (and volume) of water applied to the crop and the evenness of the application.

13–9. Type of equipment

BACKGROUND	WHAT CAN YOU DO?
<p>Irrigation systems vary in efficiency of volume of water used, energy required to operate, potential for contaminated runoff, and potential for water erosion. In order to use water most efficiently, wherever possible the water should be placed directly where a plant absorbs the water – the roots.</p> <p>The goal is to maintain plant transpiration (natural plant water use) and to decrease evaporation from plant and soil surfaces. The end result of applying water directly to the plant roots is that less water and inputs are needed to meet plant requirements, and runoff potential from the crop (including fertilizer and pesticide loss) is lower.</p> <p>Not all irrigation is intended to satisfy plant transpiration. Applications such as frost protection, wind erosion prevention, and evaporative cooling require equipment that sprays water evenly over the crop and soil surface. Although this allows for evaporation, it serves to protect the crop and is considered a beneficial use of water.</p> <p>Management is your most important tool to increase your water efficiency, regardless of your system type.</p>	<p>OPTION 1 – ACTION</p> <p>Select the most water-efficient irrigation system possible.</p> <p>Replace fixed gun, mid-level and travelling gun systems with low-level sprinklers, travelling boom systems with low-pressure spray nozzles, or centre pivot (lateral move) systems with drop tubes and low-pressure spray nozzles:</p> <ul style="list-style-type: none"> • fixed guns must be moved by hand – without good management and ample labour, they can be left in one position too long, which leads to over-watering • all guns and mid-level sprinklers shoot water high in the air allowing for non-beneficial evaporation, whereas low-level sprinklers apply water more directly to the plant and require less pressure (reducing pumping costs) • travelling booms are a good option as they can apply water closer to the plant/soil surface – however, their rapid speeds (as compared to centre pivots) means that application rates are somewhat high, which can lead to runoff • systems with lower application rates generally produce little excess water, and contaminated runoff and water erosion are eliminated. <p>If possible, depending on the crop grown, select drip irrigation systems to further reduce volume of water going to non-beneficial evaporation.</p>



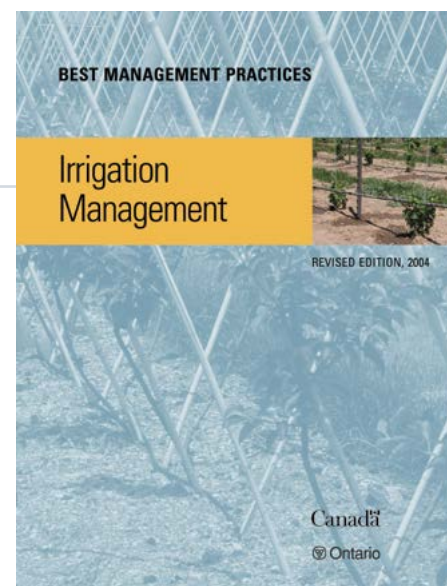
Irrigation of crops can be expensive and the right choice of equipment will be essential in maximizing profits. The correct equipment can provide significant financial savings with respect to energy and water consumption, while providing sufficient water when needed. For information on the design and per acre costs of various irrigation systems, see pages 48–76 in *Irrigation Management*.



Not all irrigation is intended to satisfy plant transpiration, such as this application for frost protection.

13–10. Timing of overhead irrigation

BACKGROUND	WHAT CAN YOU DO?
<p>Wind will reduce the uniformity of an irrigation application. Some of the water applied in a non-uniform way is wasted. Some sections of the crop may receive too little water, leading to poor crop yields. Other sections of the crop may receive more water than can be used. This excess water can promote root disease if soils remain too wet for too long. It might also percolate below the root zone, reducing the nutrients in the soil and potentially contaminating ground water.</p> <p>Water that evaporates into the air is wasted. The expense of pumping cannot be recovered as the water is not going to benefit the crop. Avoiding irrigation on hot sunny days or windy days may significantly improve the efficiency of an overhead irrigation application.</p> <p>Sometimes daytime irrigation is required due to conditions such as evaporative cooling, disease prevention, neighbour relations (sharing water or alternate water-taking during low water conditions), pumping noise, etc. In these cases, understand the benefits and costs of irrigating under non-ideal conditions.</p>	<p>OPTION 1 – ACTION</p> <p>Choose to irrigate when the wind is calm and the sun is not shining brightly:</p> <ul style="list-style-type: none"> • irrigate only when winds are less than 10 km/hr • irrigate overnight or in the early morning to reduce evaporation from sunshine. <p>OPTION 2 – MONITORING</p> <p>Use rain gauges or catch cans to calculate the ratio of the volume of water that benefitted the plant to the volume of water pumped:</p> <ul style="list-style-type: none"> • calculate your cost of pumping (\$/inch applied) to understand the cost of uneven applications or excessive evaporation.

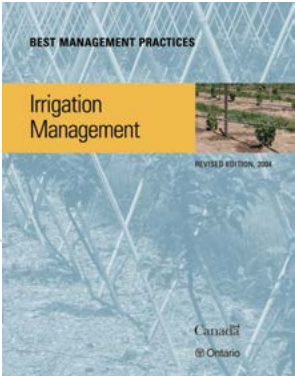


For more information about overhead sprinkler systems, see pages 49–60 of this BMP publication. For general timing tips, see pages 77–80.

See also this OMAFRA factsheet:

- *How to Prepare for Irrigation During Water Shortages*, Order no. 99-023

13–11. Design of system

BACKGROUND	WHAT CAN YOU DO?
<p>It is important that the irrigation system is well-suited to the specific crop's water needs and the area in production. If an irrigation system is too large for the crop area, you will be wasting water and energy. If an irrigation system is too small, you will not have enough time to run through the complete irrigation cycle to meet crop needs.</p> <p>There are many factors to consider when choosing a system. Use this BMP publication to help you compare options.</p> 	<p>OPTION 1 – ACTION</p> <p>Use an irrigation system that is the suitable size for your operation. Avoid watering non-cropped areas:</p> <ul style="list-style-type: none"> • use low-pressure systems of less than 50 psi wherever possible to reduce the risks associated with blown lines and guns flipping in high-pressure systems of more than 80 psi • consult a qualified irrigation designer on the system design • apply water only to the target crop and not any of the surrounding area • avoid different sprinkler heads in the same zone where you want to have a uniform application.



Watering non-cropped areas is a waste of water and energy.

13–12. Maintenance of system

BACKGROUND	WHAT CAN YOU DO?
<p>Monitoring and maintenance are key for operational efficiency. The system should be visually inspected regularly and frequently to ensure there are no leaks and water is not being wasted.</p>	<p>OPTION 1 – ACTION</p> <p>Check regularly for leaks by doing a visual inspection:</p> <ul style="list-style-type: none"> • repair leaks as soon as they are discovered to ensure operational efficiency and minimize loss of water and runoff problems • inspect the sprinkler nozzles yearly by measuring the opening of the nozzle to check if it has worn larger – use calipers or a drill bit and replace if worn • use pressure tests and flow meters to ensure system is operating as designed • follow manufacturer's manual/maintenance schedule • where necessary, consult with professional designer.



Inspect the sprinkler nozzles yearly. Measure the opening of the nozzle to check if it is worn down. If it is out of tolerance, replace it.

FOR MORE INFORMATION

Ontario Ministry of Agriculture, Food and Rural Affairs

Many sources of supplementary information are available. Below are some suggestions to get you started. Most can be found online at www.ontario.ca/omafra or ordered through ServiceOntario.

How to Prepare for Irrigation during Water Shortages, Order no. 99-023

Irrigation Scheduling for Tomatoes – An Introduction, Order no. 08-011

Monitoring Soil Moisture to Improve Irrigation Decisions, Order no. 11-037

Ontario Low Water Response – Working Together to Manage Low Water, online

Top 10 Common Law Drainage Problems between Rural Neighbours, Order no. 98-015

BEST MANAGEMENT PRACTICES

BMP publications are excellent sources to better understand on-farm environmental issues and discover a range of proven, practical options to address them. BMP materials are available at no charge to Ontario farmers. Below are a few sample titles. To order, see ServiceOntario information.

Controlling Soil Erosion on the Farm

Cropland Drainage

Field Crop Production

Irrigation Management

Managing Crop Nutrients

No-Till: Making it Work

Soil Management

Streamside Grazing

Water Management

Water Wells

Best Management Practices publications present in-depth explanations, tips and advice for Ontario farmers.

Inquiries to the Ontario Ministry of Agriculture, Food and Rural Affairs

Agricultural Information Contact Centre

Ph: 1-877-424-1300

Email: ag.info.omafra@ontario.ca

Web: www.ontario.ca/omafra

Ontario Ministry of the Environment and Climate Change

Permit to Take Water – factsheets, application forms
www.ontario.ca/environment-and-energy/permits-take-water

Order through ServiceOntario

Online at ServiceOntario Publications –
www.ontario.ca/publications

By phone through the ServiceOntario Contact Centre
Monday–Friday, 8:30 am–5:00 pm

416-326-5300

416-325-3408 TTY

1-800-668-9938 Toll-free across Ontario

1-800-268-7095 TTY Toll-free across Ontario



ACKNOWLEDGEMENTS

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