NURSERY PAPERS

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MAKING THE MOST OF PRECIOUS WATER RESOURCES

'Making Every Drop Count'

SUMMARY

- As we head into spring, water management is one of the key tasks for production nurseries
- The Nursery Industry Water Management Best Practice Guidelines leverage robust research to provide growers with best practice strategies to improve their water management operations, enhancing productivity and profitability
- The EcoHort guidelines assist production nurseries in being good custodians of water in the ecosystems in which they operate.
- This Nursery paper reiterates and re-explores two key elements of water management – storage and irrigation.
- It provides guidance as to the most effective ways to manage issues with water storage as well as the most efficient ways to irrigate plants.

BACKGROUND

In the recent Greenlife Market Analysis Report, **water security** was rated as one of the top four (4) industry issues. This is not a surprise as access to and water use efficiency are always top of mind for nursery business owners and managers. This nursery paper highlight again the importance of water security to a nursery business and to 'make every drop count'.

The industry has experienced the impacts of drought and with the uncertainty of climate change it is likely that drought will remain a threat to the industry's future prosperity and even viability. It is also likely that the cost of water will increase and pressures upon the responsible use and stewardship will become more stringent. Consistent and adequate water supply is critical for production nurseries. But, while water is crucial to keep those budding plants thriving, there are ways you can minimise wastage.

For these reasons, the industry needs to ensure that it remains a leader in the sustainable and efficient use of water. The Nursery Industry Water Management Best Practice Guidelines provide production nurseries with a starting point on building effective water management strategies. Nursery managers are also encouraged to stay up to date with the latest innovation on water use, irrigation technologies and remote monitoring technologies to stay ahead of the curve.

Greenlife Industry Australia

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MANAGEMENT OF IN-GROUND OPEN NURSERY WATER STORAGES

Maintaining the best possible water quality in a nursery water storage is essential to provide a safe and reliable irrigation water source.

Farm water storages are generally balanced and diverse ecosystems, containing microscopic plants and animals, aquatic plants, and an abundance of larger animals such as fish and insects. The entry of nursery wastewater can severely impact the balance of this ecosystem, providing environmental conditions that can be ideal for the growth of many aquatic weeds and algae.

This table outlines some of the common issues associated with in-ground open nursery water storage and some suggested remedial action. Head to ***https://nurseryproductionfms.com.au/*** irrigation-water/ for more information on other types of water storage.

DAMAGE	CAUSE	REMEDIAL ACTION
Erosion (rilling) of embankment	*Water flowing over embankment*	Pack grass sods complete with soil into any rills formed.
Settlement	*Poor compaction of the embankments of new storages.*	Check the amount of freeboard as the storage fills. Top-up the level of the crest or lower the spillway inlet.
Cracks through the embankment	*Uneven settlement*	Cracks through the wall may lead to major failure. Professional advice should be sought.
Seepage from embankment	*Water moving through the embankment.*	Check the upstream face for points where water may enter. Dig-out and repack seepage points on the upstream face of the embankment.
Tunneling through or under the wall.	*Seepage lines in tunnel prone materials such as sand will readily turn into tunnels or 'pipes'.*	As an interim measure these may be plugged with carefully compacted soil. A bentonite: sand 1:2 mix is sometimes used as a plug.
Vermin damage	*Uncontrolled access of burrowing animals.*	Dig out burrows and repack with clay- based material. Maintain effective vermin control.
Pipelines and Valves	*The most common site for storage failures is along pipelines through the embankment.*	The outlets of pipelines should be inspected for evidence of seepage along the pipe trench. Valves on pipelines through embankments should be operated periodically to ensure satisfactory performance.
Weeds and Trees	*Failure to manage vegetation.*	A 150 mm layer of topsoil should be placed over the inner and outer batters to assist in the establishment of grass cover. All deep-rooted weeds, shrubs and trees should be removed as they appear.
By-wash damage	*Damage to by-wash from erosion or poorly maintained vegetative cover.*	Establish and maintain an actively growing, robust and relatively uniform vegetative cover. Fence off area, if necessary, to protect vegetation. Keep the spillway clear of debris, tall grass etc. Consider the installation of a PVC trickle flow pipe to intercept and divert consistent small flows which lead to difficulties in maintaining by-wash vegetation. Repair erosion as soon as damage appears.
Turbidity (cloudiness)	*Erosion in the catchment or dispersive materials in the excavation. Nutrients running into the storage can increase algal growth.*	Control sediment moving into the storage. Small quantities of sediment and nutrients in catchment flows can be intercepted by a heavily vegetated filter zone immediately upstream of the storage.
Wind damage to embankment	*Wave action causing damage to embankment.*	Lay stone or establishing runner grasses on the sides of the storage where damage is occurring and consider strategic location of trees and shrubs to act as a windbreak for prevailing winds.
Leakage	*Poor construction or porous base materials.*	Clay lining of the storage or treatment with Bentonite, polymer sealants or liners.

IRRIGATION SCHEDULING IN PRODUCTION NURSERIES




The management of irrigation in production nurseries has a direct impact on plant growth and quality.

Irrigation management is a complex decision-making process, that can be complicated by a lack of specific information on plant water use, inefficient irrigation systems, the various growing media blends and ingredients used, and grower time constraints.

One basic method of irrigation scheduling relies on setting irrigation times to seasonal settings, e.g. the same application each day during the summer months and then reduced during the cooler winter periods. This method doesn't take into account daily variations in weather that occur during a season, e.g. on hot days plants will transpire for cooling and on cool days the plant will lower its respiration rate and lose less water.

Nursery irrigation that is applied without taking into account these variations will most often result in the overuse of water, excessive drainage, leaching of nutrients and reduced or uneven plant growth.

Calculated irrigation scheduling, or water budgeting, can be used to determine a more precise irrigation regime. This method involves calculating or obtaining evapotranspiration rates (ET) to determine irrigation frequency and duration. ET is the term used to describe the sum of evaporation (water moving to the air from the growing media surface) and transpiration (movement of water within a plant and the subsequent loss from leaves as vapour through leaf stomata). ET is affected by environmental factors including sunlight, air temperature, relative humidity, and wind speed.

A more accurate approach to the irrigation scheduling of nursery stock is for the irrigation application to reflect the water lost from the container itself. Weighing a number of representative containers from an irrigation block before and after irrigation gives a measure of plant water use, and the irrigation can then be adjusted to match plant water requirements.

This method offers real time monitoring of plant water use, greatly improves water use efficiency in a nursery and after a period of weighing and monitoring containers, a nursery manager is in a position to use this data, along with his skill and experience, to schedule irrigation according to current weather conditions for more accurate and efficient irrigation scheduling. Some simple measurements taken at various stages of plant development will give an understanding of the range of water requirements across the nursery. To begin measuring the actual water use of plants, follow these steps:

1. **Select the container size and plant** that is going to dictate the irrigation frequency for each block.
2. **Once the containers are at their maximum water holding capacity**, weigh a representative sample of the pots (containing plants) that have received the average application rate for these blocks.
3. **Before you next irrigate, weigh the same containers to determine the water (weight) loss**. The amount of water lost in millimetres can then be calculated from ***Table 1***. By measuring and recording the weights of a range of plants and containers in various blocks within the nursery, you can start to group plants with similar water requirements into areas.
4. **This information can also be used to schedule the irrigation**, e.g. if a 100 mm pot has lost 50 g of weight this is equivalent to 5 mm of irrigation. Checking crop water requirements over the growing cycle of the plants and over a number of years will develop a picture for the full range of plants grown.

CONTAINER SIZE (MM)	WEIGHT LOSS (G) FOR 1 MIN OF WATER
80	5
100	10
150	20
170	25
200	30
250	50
300	70

CASE STUDY: Best management practice helps Spring Creek seedlings achieve its sustainability goals

Peter and Lesley Burnell, owners of Spring Creek Seedlings, run a 100-acre vegetable and strawberry seedling production nursery in Stanthorpe, Queensland.

A first-generation nursery grower, Peter has allocated significant resources into investigating in ways to enhance production capacity by improving water use and energy cost efficiencies.

"Prolonged droughts and periods of dry has shown how important it is to maximise water use efficiencies across the business. For us, we noticed that during the drought the salt levels in the soil was increasing significantly.

"It became clear that the long-term viability of our business was going to become increasingly reliant on our ability to capture and re-treat water, so we made a number of changes like implementing new filtration systems that would help improve water quality."

Central to the success of these improvements was the business' commitment to best management practice, environmental and natural resource stewardship, which led to them achieving Nursery Industry Accreditation Scheme Australia (NIASA) and EcoHort accreditation.

"Becoming EcoHort certified has helped us ensure our nursery operated according to best practice environmental outcomes. It has put us in a position where we could reuse water and treat it to a high standard so it could be sent straight back into the nursery. During dry times we couldn't get any additional water, so we had to make sure every drop was being utilised.

"We are now working on a project making the entire nursery concrete. This will help us to better capture water that hasn't yet been contaminated by the ground, meaning there's a higher quality and quantity of water that we can reclaim, re-treat and reuse. The working environment also becomes safer, more hygienic and helps machinery operate better which boosts efficiencies and productivity levels."

"By improving water use and energy efficiencies across the business we have been able to cut costs by a third," he said.

"Though the improvements we have made across the business are costly, we are reaping the benefits from our various investments in infrastructure and filtration systems. In the next couple of years, we hope to be generating all our own power and making sure 100% of the water in the nursery is being filtered, sanitised and stored.

"We always want to make sure that we aren't having detrimental impacts on our local environment and take steps to help improve conditions and minimise erosion.

"Our advice is that best practice needs to be ingrained in the day-to-day running of your business, and it's important that you keep your staff involved in the auditing process and collaboratively work to continually make improvements.

"By putting an emphasis on continued growth and best management practice, we can continue to bolster the sustainability of our operation and long-term viability even in during times of tough climatic conditions. It also gives us piece of mind that we're doing the right thing by the land and environment in which we operate."

The NIASA program underpins the Australian Plant Production Standard managed by Greenlife Industry Australia, which is a holistic system designed to ensure a sustainable future for the nursery industry. Critically, it's driven by what the market expects of a quality product.

LINKS TO RESOURCES

- Growers are strongly urged to consult the available resources on best practice water management practices.
- Nursery Industry Water Management Best Practice Guidelines: ***https://nurseryproductionfms.com.au/irrigation-water/***
- PAST EDITIONS OF NURSERY PAPERS ARE AVAILABLE ONLINE on the GIA website: ***https://www.greenlifeindustry.com.au/communications-centre***