

# The Nursery Papers

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## Designing a nursery reed bed

Reed beds efficiently remove nutrients and organic matter from nursery runoff, see *Nursery Paper* 'Reed beds clean up nursery runoff water', issue number 2003/05. As a result, the Alstonville Centre for Tropical Horticulture in conjunction with Southern Cross University at Lismore, which were responsible for the initial research and experimental reed beds, designed and helped construct a full scale reed bed system at Bau Farm nursery on the north coast of New South Wales. This *Nursery Paper* briefly explains some of the factors to be considered when designing and constructing a nursery reed bed.

### Site preparation

Prior to constructing a reed bed, a land survey should be conducted by a qualified surveyor. An engineer may be required to prepare site plans and design specifications for a Council Development Application.

If a holding dam is to be built, soil texture characteristics should be examined to determine if the soil will hold water. Deep free-draining soils are notorious for producing leaky dams. Dams and reed beds built in such soils may have to be lined. This is an additional cost but it may be the only viable long-term option. A dam liner made to size may cost from \$3 to \$10 per square metre. On some soil types the incorporation of bentonite or the use of imported clay into the dam surface may be an option.

### Runoff recycling system

Runoff from your nursery will be from either irrigation or rainfall. Under normal conditions runoff should flow into the reed bed, while high flows generated by rainfall

events should bypass the reed bed via the hi-flow diverter to a holding dam.

Sediment and baffle traps are often used to filter out extraneous materials from nursery drainage. These should be located before the hi-flow diverter, see figure 1.

### Reed bed design

Reed beds are highly efficient at removing phosphorus from nursery runoff, regardless of the time it takes for water to pass through a reed bed, usually measured in days and known as the hydraulic residence time (HRT). Nitrogen removal, or the targeted amount of nitrate reduction, is the determining factor when sizing a reed bed.

For most nurseries the HRT will range from two to four days. This is because the effluent nitrate-

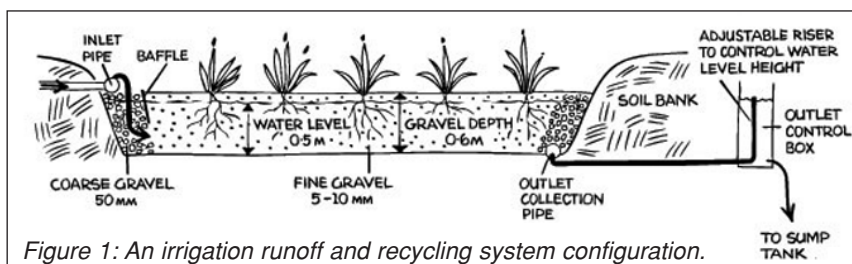


Figure 1: An irrigation runoff and recycling system configuration.

N concentration can vary from 1 to 20 milligrams per litre (mg/L) depending on irrigation efficiency and fertilisers used.

Runoff from your nursery should be metered during times of high irrigation usage. It can vary from 40-70% of total water applied.

Once the runoff rate is measured and the desired residence time calculated, the reed bed volume and surface area can then be determined using mathematical formulae.

A range of substrates has been used in reed beds around the world. We recommend either five millimetres or 10 mm blue metal. The size, shape and porosity of the substrate governs its hydraulic conductivity. This is the maximum rate at which water will flow through the reed bed – an important design criterion in determining the length to width ratio of the reed bed.

The inlet distribution is designed so that it gives an even flow across the reed bed. Short-circuiting of



*Bau Farm Wholesale Nursery on the New South Wales north coast has a production area of five hectares. To clean its runoff water two reed beds were constructed, each 150 cubic metres, sealed with heavy-duty plastic and filled with five millimetres of blue gravel.*

the flow will compromise the treatment performance.

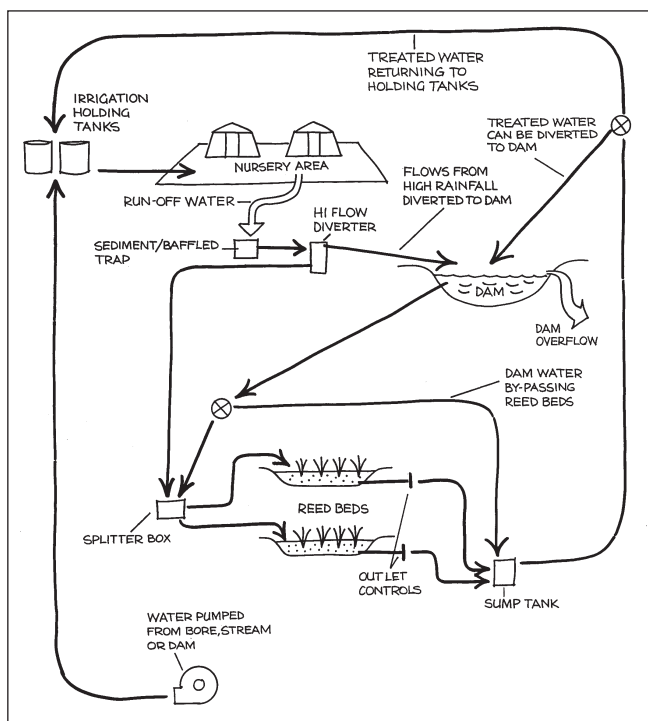
The outlet control device should be an adjustable riser. This allows control of the water depth in the reed bed. The recommended water depth is 50 centimetres.

### The bottom line

Designing a reed bed for a commercial nursery is a complex procedure, but it can be simplified if done in a systematic way. To help nursery operators in this regard and to provide additional technical information on reed beds, a technical bulletin titled, 'Constructing a reed bed to treat runoff water – a guide for nurseries' is currently being prepared for print. To secure your copy please contact NSW Agriculture, PO Box 72, Alstonville, 2477.

### Acknowledgments

This *Nursery Paper* was written, and the research carried out by, by John Dirou and David Huett from NSW Agriculture, Centre for Tropical Horticulture, Alstonville and Tom Headley from Southern Cross University School of Environmental Science and Management, Lismore.



*Figure 2: Cross sectional side view of a typical reed bed.*



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