



# Are there plants in your wetland?

*“Nature, like a careful gardener, thus takes her seeds from a bed of a particular nature and drops them in another equally well fitted for them”*

*Charles Darwin*

*On the Origin of Species 1859*

## *Revegetating wetlands*

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*Authors*

Margaret A. Brock and Michelle T. Casanova  
Botany, UNE, Armidale, NSW

*Photography*

Chris Cooper, Michelle Casanova, Stuart Blanch, Peter Jarman  
Cover: Barmah Forest - Kevin Edwards

*Editing, design and  
production*

Sally Berridge Communication Consultancy (02) 6241 7001

LWRRDC GPO Box 2182 Canberra ACT 2601. June 2000.

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# Are there plants in your wetland?

## Revegetating wetlands

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#### **There are two companion booklets in this series**

1. Brock, Margaret A. 1997. *Are there seeds in your wetland? Assessing wetland vegetation.*
2. Brock, Margaret A., Casanova, Michelle T. and Berridge, Sally M. 2000. *Does your wetland flood and dry? Water regime and wetland plants.*

These booklets cover other aspects of wetland revegetation and management. They are published by LWRRDC and UNE and are available (postage and handling costs only) from the Agriculture, Fisheries and Forestry - Australia Shopfront at Core 2, Cnr Broughton and Blackall Streets, Barton, ACT 2600. Phone 1800 020 157.

# Why revegetate a wetland?

*Some wetlands have no vegetation, either because they are new, or because the vegetation that was there has died. Vegetation can be killed by periods of drought, or by extended periods of flooding or grazing. Some drought and flood cycles are natural but others have been brought about by humans, and this is when extended changes to the vegetation are likely to occur.*

*A wetland without plants is unsightly and without intervention can remain muddy and denuded. In this booklet we will give you some ideas on vegetating or revegetating a wetland. Plants are part of the food chain in wetlands. They provide food, habitat and breeding sites for a variety of organisms including fish, water birds, invertebrates (including insects), algae, fungi and plants. Plants are part of the biodiversity in wetlands, and help maintain it.*

*Wetlands typically have several kinds of habitat where plants can grow: soil at the edges; soil covered by shallow or deep water; the water itself, and the water surface. Some water plants can grow in one or all of these habitats: some grow in the soil at the edge or under water, others float on the surface with dangling roots, and still others have no roots at all.*

*Water plants can help keep the water clear by stabilising sediment and preventing re-suspension of mud. They also use nutrients that might otherwise encourage algal blooms, and can provide habitat for animals such as snails and tadpoles that eat algae. Plants growing at the edge of wetlands can filter runoff from the surrounding land and prevent sediments, contaminants and rubbish such as plastic bags from reaching the water. Edge plants provide habitats for frogs and birds such as reed-warblers, coots and herons. Plants growing in shallow water typically have growing parts above the water level and provide nesting sites for swamphens, moorhens, grebes, swans and ibis. These emergent plants transport air down their stems to the soil and prevent the soil from becoming smelly and non-productive due to lack of oxygen.*

- **What happens to the plants when water levels drop or the wetland dries out?**

*Plants can persist in several ways: as growing plants that are drought tolerant; as drought resistant tubers or fragments in the soil; or as seeds in a soil seed bank (see ‘**Are there seeds in your wetland? Assessing wetland vegetation**’ — details page 1). When the wetland floods again the drought-resistant species are refreshed and the tubers and seeds are stimulated to grow. We can use these natural abilities of plants to assist us in revegetating wetlands.*

- **If you want to revegetate your wetland you need a vision in mind at the outset.**

*What kind of wetland do you want to create? How do you want your wetland to develop? Remember that a healthy wetland is a complex, dynamic system that is changing all the time.*

- **It is a good idea to read the whole of this booklet before you embark on any of the activities.** *This booklet is not a means of identifying wetland plants, nor does it give a fool-proof recipe for success in revegetation. Plant species and wetland conditions vary too much throughout Australia for that information to be possible in a single booklet such as this.*

**However, by working through this booklet you should be able to:**

- Find out the types of vegetation present in your wetland, and
- Gain an idea of how to establish some new wetland plants, if that is desirable.

# What is your vision for your wetland?

The ideal vegetation for your wetland will depend on the depth and area of your wetland, as well as what you would like to see. It can be useful to get some ideas from natural wetlands in the local area.

Many people like to see areas of open water. However, if your wetland is shallow it could become fully vegetated. Areas of open water are generally present only when the water stays deeper than about 2m.

Remember wetlands are dynamic and it is normal for the vegetation to change from season to season and year to year.

## The aims of revegetation

- To introduce desirable plants to your wetland, and
- To develop a plant community that will sustain itself naturally.

It may take your wetland ten years to develop self-sustaining vegetation and become a diverse habitat. However, under the right conditions, vegetation can be established from seed bank or transplanted plants within about three years, and, hopefully, birds, tortoises and frogs may soon follow.



Photos: C. Cooper

A denuded wetland before revegetation activities.

## How long will it take? We will need patience!

*In natural wetlands the vegetation takes decades or even centuries to develop, so you can't expect to see a fully vegetated, functioning wetland habitat after only one year.*

## Checking your progress

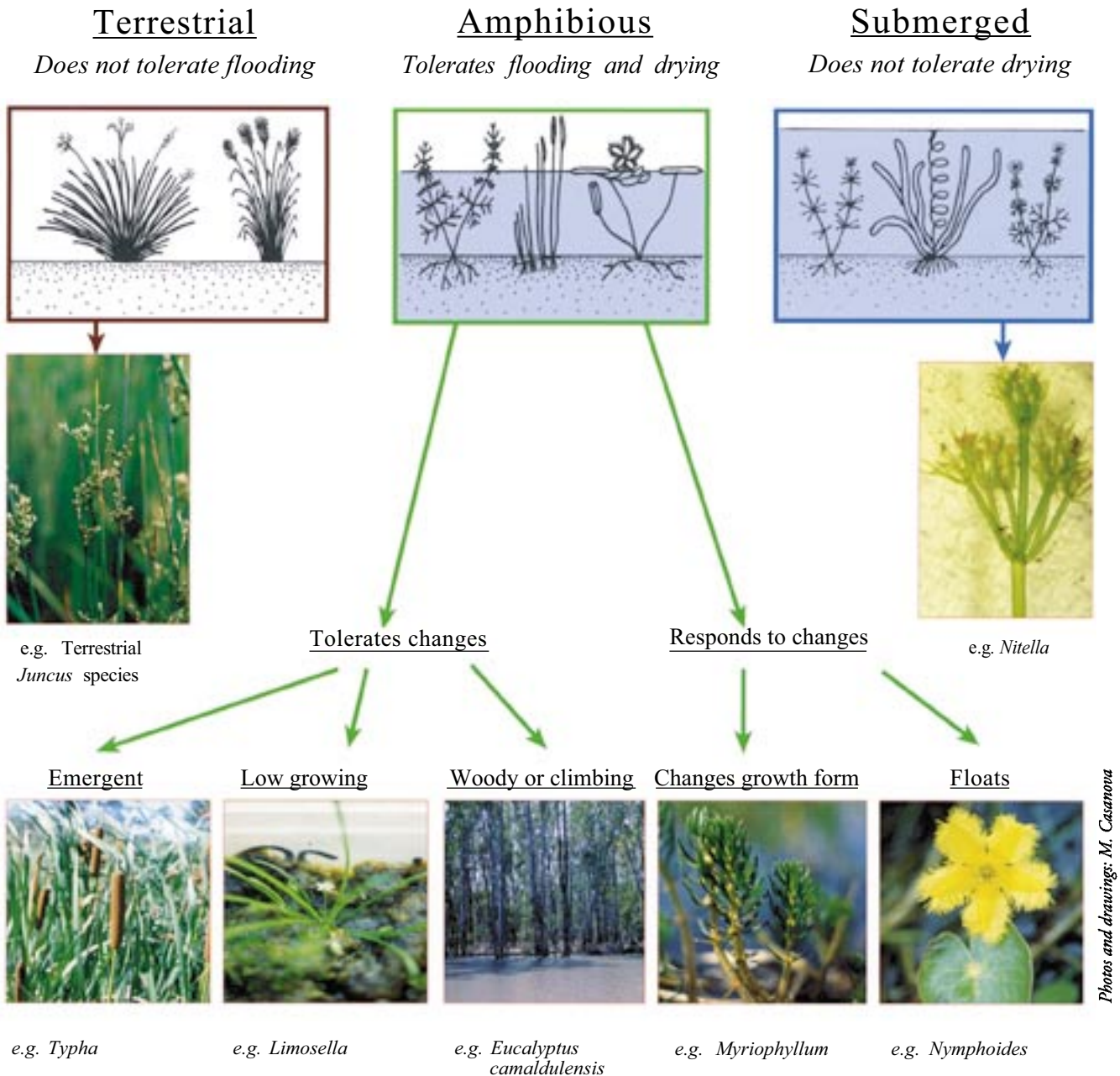
As we have suggested, revegetating a wetland is a long-term activity, and in a few years time it would be interesting to have records of 'then' and 'now'.

- At the outset of your project, take some photos of the wetland, and from time to time return to the same spots and record how things are going. You could mark the spots, and remember to date your photos.
- If you are undertaking the kinds of surveys we suggest in this handbook, keep your records together, so that you can compare notes as time goes by.
- You might care to photograph the activities you undertake, such as adding seed bank, and see how the new plants become established. Label and date these photos too.
- If you are interested in the birds and other wild creatures that inhabit your wetland, record sightings of the different species, and see if they change over time.
- Compare your wetland with a similar one that has not been revegetated, using a series of photographs.

# What wetland plants might be present?

Often it is more important to know what sorts of plants are present and their response to water level, rather than worrying about their Latin names.

The figure below provides a key to assist you to work out what kinds of plants you have. The plants in the figure have been divided into groups related to where they are growing relative to the water and how they cope with water level changes.



**Figure 1. Grouping wetland plants by their response to water level changes**

# Habitats in your wetland

Habitat	Water presence	Types of plants you might find
<b><i>Terrestrial (land) zone</i></b>		
Above the highest water level	Dry. Water never or rarely reaches here	<b><i>Terrestrial species</i></b> Eucalypts, wattles, sheoaks, pasture grasses and dryland plants.
<b><i>Edge zone</i></b>		
Between the water's edge and the highest water level	Water sometimes reaches this area	<b><i>Amphibious and terrestrial species</i></b> Reeds, grasses, herbs, pasture weeds and legumes.
At the waters edge	Water level fluctuates here	Sedges, rushes, knotweed, water milfoil, grasses and other flowering plants including some amphibious shrubs, trees and vines.
In shallow water	This area sometimes dries out	Some algae, waterwort, rushes, reeds.
<b><i>Submerged zone</i></b>		
In deep water	This area rarely dries	<b><i>Submerged and amphibious species</i></b> Some algae, ribbonweed, pondweed.
The water itself	This habitat disappears when the wetland dries out	Microscopic algae, liverworts, plants without roots.
The water surface	This habitat disappears when the wetland dries out	Floating duck weed, floating fern.

**Table 1. The habitats in a wetland and the sorts of plants that occupy them**

# What vegetation is already in your wetland?

Before revegetating, it is useful to know the varieties of plants already growing in the wetland, and to get an idea of what is present in the seed bank. You can survey the existing vegetation before deciding if you want to change it. Maybe natural revegetation is already taking place.

Remember that Australian wetlands are often dry, and if you survey the wetland only when it is dry or wet, you may get an incomplete idea about the plants it contains. By surveying in different seasons you will include differing water conditions.

If your wetland is dry you could survey its seed bank to see what potential plants are already there. You can find out how to do this from a companion booklet: *'Are there seeds in your wetland? Assessing wetland vegetation'* (Details on page 1).

*To find out what vegetation is already in your wetland you will need to:*

- **Survey the habitats present:** i.e. See what habitats are present in your wetland, and gain an idea of the plants in each habitat type (page 7).

- **Survey the plants present:** i.e. Find out what plants are already growing at different depths by surveying plants along a depth gradient (transect) — see page 8. You may also like to do similar surveys in different parts of the wetland or in other wetlands for comparison.

- **Assess the numbers and varieties of plants you have found.**



Photo: C. Cooper

*Mother of Ducks Lagoon, Guyra, NSW. Winter 1995.  
Water level is Low, Glyceria has died back.*



Photo: C. Cooper

*Mother of Ducks Lagoon, Guyra, NSW Water level higher, spring 1995.*



Photo: C. Cooper

*Mother of Ducks Lagoon, Guyra, NSW Full in summer 1995/96*



# Vegetation surveys

**Purpose:** *To assess what plants are growing in your wetland before and after your revegetation activities.*

## 1. Habitat survey

Table 1 (page 5) shows the main habitats of a wetland in relation to the likely water levels, and also shows the types of plants you might find in those habitats. The groups of plants in Table 1 are coloured to reflect the groups shown in Figure 1 (page 4).

**Step 1.** Walk around your wetland and look for the different habitats and plants that may be present.

**Step 2.** Record all the habitats you can find. If your wetland has only a few plants at this time, make up your own table similar to Table 1, listing the habitats in your wetland. Not every wetland has all the habitats listed in Table 1. For example, some wetlands may not have deep water at all. Others could have an artificial water source and may not have fluctuations in water level, which means that the edge zone may not exist.

**Step 3.** Record the plants in each habitat by walking around the edge and into the water, and writing down the number and types of plants that are growing there.

You may find that your wetland has more plants than you thought at first, and you may want to do a depth gradient (transect) survey, which is more thorough, as suggested on pages 6 and 8.

It is a good idea to do a transect survey anyway, so that you can compare the original state of your wetland with the state it is in after you have done some revegetation work, or when the water level has changed. Also you may want to compare it with a wetland that has not been revegetated.

**Step 4.** Draw up a table based on Table 1 to record what you have found.

**Step 5.** Interpret what you have found by answers to some or all of these questions — How many habitats are present? Do they vary over time? What habitats were absent? Were there more habitats or plants than you had anticipated?



*Llangothlin Lagoon, NSW showing terrestrial, edge and submerged zones.*



*A variety of plants (low-growing, emergent and plants that change growth form) in a wetland's edge habitat.*



*Melaleuca swamp near Bellingen, NSW The trees are 'amphibious' plants that tolerate changes in water level.*

## 2. Survey of plants along a depth gradient

**Step 1.** Select a typical area of wetland. If there is variation in the amount of vegetation present, try to choose an 'average' site, or plan to do two or more surveys along depth gradients into the water.

**Step 2.** Choose a point on the bank that is well above the high water line and mark this as the start of your survey. *The edge vegetation is very important for wetlands and this may be where the greatest number of plants can establish.* Hammer a stake into the soil at this point to make a permanent record of where you started this initial survey.

**Step 3.** Use a tape measure or string and stake to run a line out towards the centre of your wetland.

**Step 4.** Starting above the high water line you can: EITHER record each plant that touches the line and its position above or below the water, OR, if you prefer, use a fixed area with the quadrat and look at the plants within it. Record the types of plants in quadrats (and numbers if you wish) at distances you choose, and record the depth of water.

**Step 5.** Record each plant by its growth form or where it grows using Figure 1 and Table 1 (pages 4 and 5). Record the names you know. If you wish to identify the plant species, collect specimens (including flowers if possible) in plastic bags and label. Later, press the plant samples between sheets of newspaper.

**Step 6.** Continue to record the plants as far as you can into the water. A garden rake and waders or a mask and snorkel can help in deeper areas.

### You will need:

- *Essential:* a metre rule; a tape measure; string, stakes and a hammer; plastic bags for specimens; a notebook and pencil. Also, protection against sun and insects.
- *Optional:* a garden rake; a quadrat with 0.5 m sides (make this from wood or wire, see below); a mask and snorkel; a glass bottomed bucket; gumboots or waders for deeper water.



Above: *Equipment for a vegetation survey*



Right: *Sampling the edge community species within a quadrat. Note the 30 m tape laid out along the transect line.*

**Optional step 7.** You have identified your plants to growth form or group. You may wish to identify them further, to species. Approach people with local knowledge of plants in your region. Use the references listed at the end of the book, or local species keys and lists to help identify your plants.

**Step 8.** Using your distance and depth measurements draw a depth profile of your wetland and plot the plant groups you have found on it. You might use this to compare with later surveys or other wetlands.

**Optional step 9.** If you wish to assess the variability of plants growing within your wetland, or to do a more complete vegetation survey, repeat this procedure in different parts of your wetland and another wetland for comparison.

**Step 10.** Count the number of different sorts of wetland plants in your wetland. **How many growth forms are there (from Figure 1)? How many different sorts within each growth form group? How many habitats did you record (from Table 1)? Did they all have plants present? Were there more plants in some habitats than others?** The answers to these questions will reflect your type of wetland and give you an idea of what you could expect to grow there.

**Are there many wetland species? Do they cover much of your wetland area?**

- *If the answers to these two questions are both 'yes' you may not need to re-establish plants in your wetland.*
- *If the answers are 'No' then you might consider the revegetation activities mentioned on pages 15 and 16*

**Optional step 11.** Mark some spots as photo points along your transect line. Take photos at intervals and in different seasons for your wetland album, to track changes and development over time. Record the date and location of each photo.

## Other surveys

If you have a wetland that you plan to use as a 'donor' wetland for revegetation (i.e. a source of plants or seed bank) you should survey that wetland too, to ensure that the sort of plants you would like are present.

If you revegetate your wetland by transplanting plants or seed you could repeat this survey once a season or on a yearly basis to assess when and whether plants are establishing.

You may prefer to do only an initial survey and then a second survey after a couple of years (it could take that long or longer for plants to establish).



Photo: C. Cooper

Sampling the edge habitat within a quadrat.



Photo: P. Jarman

Surveying a wetland on the Gingham watercourse, Moree, NSW

# Establishing new vegetation

*Your wetland surveys will help you to decide whether to introduce new plants or seeds to get vegetation established.*

*In this section we will give you information about:*

- *Establishing plants by encouraging natural regeneration;*
- *Establishing plants by introducing a new seed bank; or*
- *Establishing plants by planting seedlings.*

## 1. Natural regeneration

If your wetland is new or has never had plants you could wait for nature to introduce plants. Plants will arrive naturally over time, carried by birds, tortoises, water, wind and other vectors. If your wetland has the right conditions, plants will eventually establish.

If there are plants and seeds in your wetland, you may be able to encourage regeneration of the vegetation in the wetland. For natural regeneration plants and seeds need:

- A suitable temperature range;
- Sufficient water for sufficient time in the right season;
- Shelter from environmental extremes;
- Sufficient light;
- Reduced competition from other plants;
- Protection from herbivores; and
- A suitable slope for plant establishment.

If plants in your wetland were once abundant but have disappeared there may be seeds in the seed bank. You can assess this by germinating sediment samples. (See *'Are there seeds in your wetland?'* Details on page 1). Many wetland species have seeds that live for several years.

The most common reasons for plants to disappear are alteration in the pattern of water level changes (water regime), or an increase in grazing. Two steps that could be effective in restoring vegetation are:

- Restoration of a more natural water regime; and
- Exclusion of animals such as cattle, sheep, ducks and moorhens.

More information about water regimes can be found in the companion booklet *'Does your wetland flood and dry?'* (Details on page 1).



Photo: M. Casanova

*Plants establishing on wetland margins at Lake Bolac, Vic.*



Photo: M. Casanova

*Sheep grazing on a denuded wetland edge*

## 2. Introducing new seed bank or plants

*If the results of your surveys indicate that natural regeneration of plant communities is not occurring, then you might consider introducing more desirable plants from outside the wetland. You can introduce:*

- *Seed bank from another wetland;*
- *Plants from another wetland; or*
- *Plants from a commercial supplier.*

### Ethics

For the first two options you need to have another wetland nearby that has the species that you would like in your wetland. This gives you the ethical dilemma of deciding whether it is a good idea to take the resources from one wetland and donate them to another. Wetlands are fragile ecosystems, so you need to be sure that you are not causing damage.

*It's a bit like 'organ donation' for humans. Be sure that removing 'organs' (plants or seed bank) from one 'body' (wetland) doesn't cause its death or damage its health!*

However, an extensive and healthy wetland can sometimes afford to donate seeds or plants because you will need only small amounts. If you choose this option you will need to survey the 'donor' wetland to be sure that removing some plants or seeds will leave its vegetation essentially intact, without damage or scars.

*In 1859, Charles Darwin found 537 plants 'of many kinds' grew from a breakfast cup of mud from the edge of a little pond.*

### Two important reminders

- 1. Remember to obtain permission from the wetland owners before you remove any plants or seed bank material.*
- 2. Check thoroughly before the transplant to ensure that you do not introduce or spread undesirable species to your wetland.*



Smartweed – *Persicaria* sp.



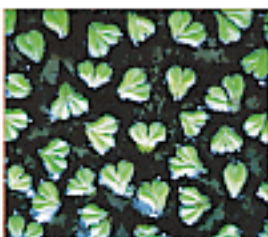
Sedge – *Cyperus* sp.



Spikerush – *Eleocharis* sp.



Water milfoil – *Myriophyllum variifolium*



Floating liverwort – *Ricciocarpus natans*



Floating fern – *Azolla filiculoides*



Nardoo – *Marsilea* sp.



Swamp stonecrop – *Crassula helmsii*

Photos: M. Casanova

## Collection of seed bank

A seed bank is the store of dormant seeds in the sediment of the wetland. The seeds come from last year and from previous seasons.

The seeds from some plant species in the seed bank germinate every year; others wait until conditions are just right—which may be once in several years. In nature, germination from seed banks is patchy.

A small amount of seed bank can revegetate a whole wetland, but if you collect all the soil you need from one spot, you may miss some of the species you want. Collect seed bank by taking small portions from a large area: a little (a handful or a spadeful) from here, a little from there. Collect over a range of depths, too: a little from high on the bank, some from the waters edge, some from under the water. Only a few 10 litre buckets of wetland soil will provide a starter seed bank for your own wetland.

*Disturb your donor wetland as little as possible. Leave it without permanent signs of your seed bank collection.*

## Collection of wild wetland plants

Use a similar method for collecting plants from natural wetlands. Take only a few plants from any one spot, then move to another place to collect more. Plants often do not transplant well. Try taking a spadeful of soil and plants, so that if the plants die, the seed bank will remain. Keep your selections to a minimum since you are only providing the start for your wetland, not trying to revegetate it in one go.

## Commercially propagated plants

The third option, and one that is a good one because many plant varieties are available, is to purchase plants from a wetland plant supplier. These are delivered ready to be planted and should be grown from seed by the supplier. Many nurseries sell aquatic plants, or can direct you to suppliers. Beware of introducing non-native plants to your area.



Photo: C. Cooper

*Collection of seed bank material from a New England wetland.*



Photo: C. Cooper

*Constructed wetland at Western Plains Zoo, Dubbo, NSW planted with commercially propagated wetland plants.*

### 3. Important considerations in revegetation

*The same factors that can prevent wetland plants from establishing naturally are important when you introduce seeds or plants.*

#### Temperature

Wetland plants can germinate throughout the year. The best season for establishment will depend on the climatic zone in which you live.

August to November, and February to May are the best months to encourage establishment in southern Australia, depending on the timing of your wet season.

In northern Australia wetland plants germinate during the wet season from November to March.

#### Water

Obviously if there is no water in a wetland, the plants won't grow, but in some wetlands high water levels and long-term flooding can also prevent plant establishment. The seeds of some Australian plants must dry out before they will germinate. If the water level in your wetland has been maintained at an artificially high level, allowing the water level to fluctuate can encourage plants to establish (see the companion booklet *'Does your wetland flood and dry?'* Details page 1).

If you can control the water level in your wetland and allow it to dry out in summer (in southern areas) or winter (in northern areas), **SLOW** refilling can encourage plant establishment.

#### Shelter and protection for the new plants

Mulch at the edge of the wetland, or buffers (logs or rocks) which reduce water movement can also encourage wetland plant establishment.

If cattle and sheep graze your wetland then fencing all or part of the wetland will help plants to establish. Provision of water for domestic animals away from the wetland (e.g. by pumping to troughs) is a good long-term practice. Ducks and moorhens can also eat and trample establishing plants. They can be deterred by fencing over the top of small areas where you want plants to establish. Damage by yabbies and other invertebrates is more difficult to control, especially under water. It may be best to establish plants when water levels are low and animal pressure is reduced.

#### Light and turbidity

All plants need light to grow. Lack of light can be caused by muddy water (turbidity) or lots of algae floating on the surface. You can clear muddy water using commercial clearing agents such as alum or lime. If the plants establish in chemically cleared water they can help to maintain water clarity.

Removal of carp (if present) may reduce turbidity.

Wind and waves can cause turbidity in shallow waters.

## Competition and weeds

Competition with weeds can reduce the success of water plant establishment. It is often less of a problem under water since most terrestrial weed species don't survive flooding for long. However, some of the major aquatic weeds could be a problem in your area (e.g. water hyacinth, salvinia, lippia etc.).

Make sure any transplanted seed bank material does not have high weed seed loads.

The usual way of reducing weed competition is to remove the undesirable species. If you use chemicals you can also kill vulnerable desired species. Also, spraying chemicals near wetlands is not a good idea because some sprays can harm fish, frogs and invertebrates.

Transplanting larger plants that are already established can overcome the problem of weed competition to some degree. Sometimes species such as bulrush or cumbungi (*Typha* species) can dominate wetlands. Many of these 'weedy' wetland species have seeds that are dispersed by wind, so it isn't possible to prevent them from arriving.

You can, however, selectively remove weeds and other plants to maintain a desirable combination of species in your plant community.

## Slope

The slope of your wetland banks can be important. If the slope is too steep there will be only a narrow zone in which plants can establish. If the slope is gentle then the space available for plant establishment is much greater.

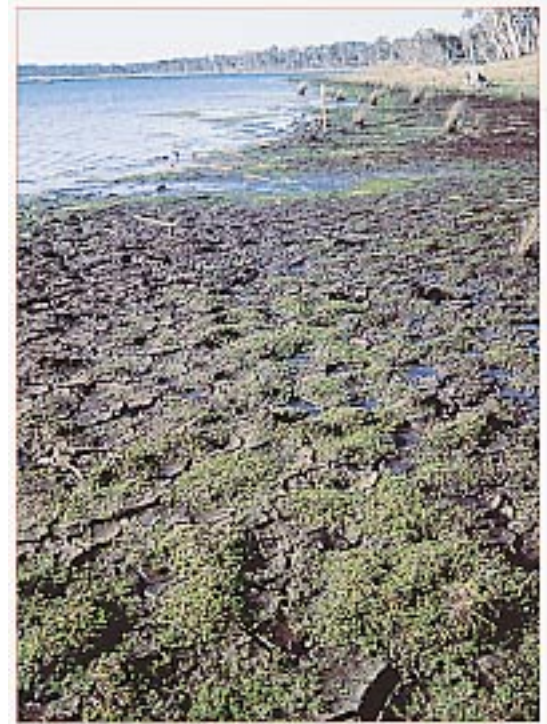


Photo: S. Blanch

Seedlings establishing in rewetted edge of Llangothlin Lagoon, NSW



Photo: S. Blanch

Seedlings establishing in rewetted mud in the edge zone.



Photo: C. Cooper

Wetland seed bank being added to the slope of a farm dam.



# How to revegetate

## 1. Adding seed bank to your wetland

**Step 1.** Determine how much seed bank you will need to collect for the recipient wetland. Two or three 10 litre buckets of seed bank material will be sufficient for 20 lines 10 m long and 0.1 m wide. Remember, you are not aiming to install wetland vegetation in one go. You are simply providing a starting point for plant colonisation.

**Step 2.** Choose a site in the donor wetland and mentally divide it into different zones in relation to the water level. E.g. Zone 1 could be above the water level, Zone 2 at the edge, Zone 3 under the water. Within each zone decide how much seed bank you want to collect, then work within the zone. If in doubt, collect less than you think you will need!

**Step 3.** Dig up a trowel-full of soil and put it in the bucket. Move to a spot a metre away and repeat. Continue until you have as much seed bank from that zone as you think you will need. Don't worry about including a few plants with the soil — if they survive they will contribute to your revegetation project. When you have completed collecting in one zone, move to the next and do the same thing.

**Step 4.** Take the soil (seed bank) home, then spread it out on a large piece of plastic and mix well. Mixing soil from all the zones means that wherever you eventually put the seed bank, all species have an opportunity to establish. This is a useful strategy when you don't know how water levels will vary over time.

**Step 5.** Let the soil dry out in the sun. This may take days or weeks (2–20 days), depending on the weather. Cover it overnight or if it rains.

### *To collect seed bank material or living plants you will need:*

- A **donor** wetland nearby (where you collect the seed bank);
- Some form of transport to carry the heavy soil to the place where you will dry and mix the samples;
- A digging implement (eg. trowel);
- Bucket or waterproof container;
- Gumboots or waders; and
- A hat and other protective gear such as sun screen and insect repellent.

We dry the soil because the seeds of many Australian wetland plants require drying before they will germinate in large numbers. Drying the seed bank will maximise the number of plants germinating. When the seed bank is dry take it to the recipient wetland.

**Step 6.** Spread the seed bank material in lines perpendicular to the water's edge, going from above the water level to some way under the water. Make these lines at least a couple of metres apart. The lines of seed bank can be up to 30m apart and still be effective in allowing plants to establish. Work from above the high water mark to as deep in the water as you care to go, and spread a narrow line of seed bank. By spreading the seed bank down the slope you will be giving all species the chance of establishing, especially if water levels fluctuate in your wetland.

**Step 7.** If disturbance by ducks or other animals is likely to be a problem, you may want to cover the strips of seed bank with wire netting until plants are established.

## 2. Using growing plants

If you are using established plants you can collect them in a similar manner to the collection of seed bank. Keep each group of plants separately, and note the approximate water depth where you collected them. Prevent them from drying out in transit by putting them into plastic bags and then into an insulated container with ice or cooler blocks.

The plants could also be kept in damp newspaper. Plant them within a day or two, in a water depth similar to that where you collected them.

## 3. Commercially grown plants

If you decide on commercially grown plants, get information about whether the plants are terrestrial, amphibious or submerged species. Also check where the plants will establish best in relation to water level, and the ideal planting depth for each species. Again, plant them in the appropriate water depth.

# Plants you might want in your wetland

### Common name      Species name

#### Amphibious plants

Australian sweet grass	<i>Glyceria australis</i>
Blowngrass	<i>Agrostis avenacea</i>
Clubrushes	<i>Isolepis</i> species
Waterwort	<i>Elatine gratioloides</i>
Flat sedges	<i>Cyperus</i> species
Floating fern	<i>Azolla</i> species
Floating liverwort	<i>Ricciocarpus natans</i>
Floating pondweed	<i>Potamogeton tricarlinatus</i>
Lilaeopsis	<i>Lilaeopsis polyantha</i>
Liphocarpha	<i>Liphocarpha</i> species
Loosestrifes	<i>Lythrum</i> species
Knotweeds or smartweed	<i>Persicaria</i> species
Mud mats	<i>Glossostigma</i> species
Mudwort	<i>Limosella australis</i>
Nardoo	<i>Marsilea</i> species
Paperbark	<i>Melaleuca</i> species
Pennyworts	<i>Hydrocotyle</i> species
River clubrush	<i>Schoenoplectus validus</i>
Sedges and tassel sedges	<i>Carex</i> species
Sneeze weed	<i>Centipeda minima</i>
Spike rushes	<i>Eleocharis</i> species
Swamp isotome	<i>Isotoma fluviatilis</i>
Swamp stonecrop	<i>Crassula helmsii</i>
Swamp wallaby grasses	<i>Amphibromus</i> species
Wetland sedge	<i>Cyperus sanguinolentus</i>
Water milfoil	<i>Myriophyllum</i> species
Water snowflake	<i>Nymphoides</i> species

### Common name      Species name

#### Submerged plants

Pin fern	<i>Isoetes muelleri</i>
Ribbonweed	<i>Vallisneria</i> species
Soft stoneworts	<i>Nitella</i> species
Stoneworts	<i>Chara</i> species
Waternymph	<i>Najas tenuifolia</i>

#### Terrestrial plants

Pin rushes	<i>Juncus</i> species
Purslane	<i>Portulaca oleracea</i>
Water panic	<i>Panicum gilvum</i>
Swamp daisies	<i>Brachyscome</i> species

# References

Many references may be available by ordering through your local library. Also, your local Landcare or Rivercare group, or Greening Australia may be able to help you.

You might have to use your ingenuity to obtain help in identification, seeking out local experts, government departments or CSIRO herbaria etc.

## ***The following books might help you to identify plants in your wetland, or be further references on wetland revegetation:***

1. Aston, H.I. (1973). *Aquatic plants of Australia*. Melbourne University Press, Melbourne.
2. Boulton, A. J. and Brock, M. A.. (1999) *Australian freshwater ecology: processes and management*. Gleneagles Publishing, Glen Osmond, South Australia.
3. Chambers, J. M., Fletcher, N. L. and McComb, A.J. (1995). *A guide to emergent plants of South Western Australia*. Marine and Freshwater Research Laboratory, Environmental Sciences, Murdoch University Press.
4. Collins, C. (2000). *A guide to wetland rehabilitation for community groups in NSW* WetlandCare Australia, Ocean Watch and NSW State Wetland Action Group.
5. Romanowski, N. (1998). *Aquatic and wetland plants: a field guide for non-tropical Australia*. University of New South Wales Press, Sydney.
6. Sainty, G.R. and Jacobs, S. W. L. (1994). *Water plants of Australia*. Sainty and Associates, Sydney.
7. Sainty, G.R. and Jacobs, S. W. L. (198 1). *Water plants of New South Wales*. Water Resources Commission, Sydney.
8. State Floras—these are volumes relating to the plant species found in each State. Two examples are:  
Harden, G.J. (editor). (1990–1993). *Flora of New South Wales: volumes 1–4*. University of New South Wales Press, Sydney, and  
Walsh, N.G. and Entwisle, T. J. (1994–1996). *Flora of Victoria: volumes 2 and 3*. Inkata Press, Melbourne.