PEOPLE LED PREVENTION | TRAINING PACK

Landcare
New South Wales

Long Stem Planting in Flood Prone Areas and Revegetation to Reduce Erosion Flood Impacts

In this training pack, we are aiming to build resilience to the risks of flooding through a focus on riparian restoration and the role that vegetation plays in riparian zones by reducing erosion.

Nature-Based Interventions to Mitigate Risk and Manage Floods

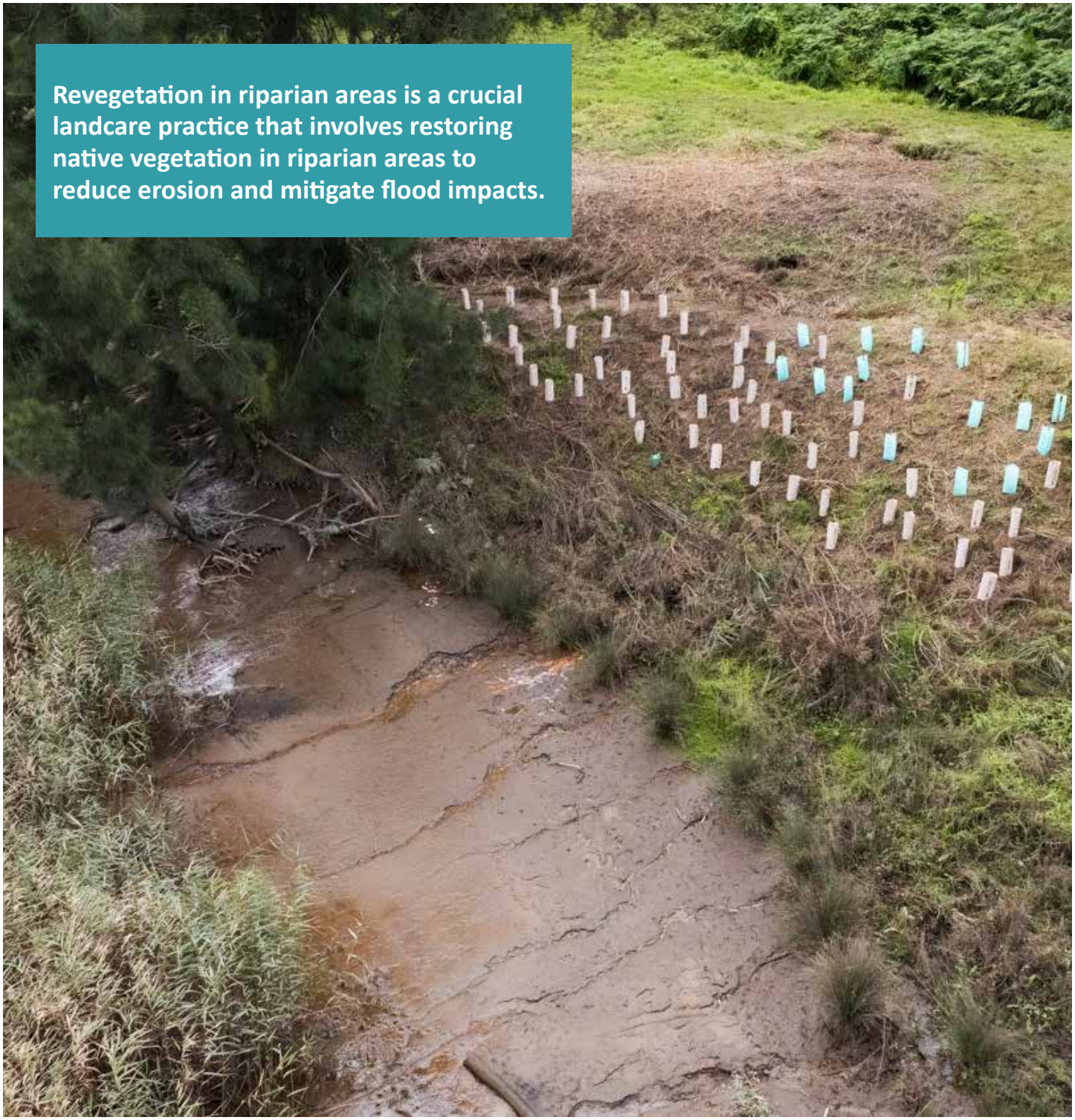
Embarking on a project to restore a riparian zone requires careful consideration. Before diving in, it's essential to plan well, prepare thoroughly, and understand what you're getting into. This guide is here to offer helpful tips that you can use to plan and carry out your project successfully and ensure it has the best chance of succeeding.

Reducing erosion is a vital component of flood risk management. Recommended actions for landholders to reduce erosion include:

- Establishing or maintaining a wide, vegetated riparian zone
- Fencing off the area from stock
- Use Logs and Earthworks on the embankment to reduce water flow
- Soil Health and Water Diversion/Retention
- Focus on Maintenance

Before you start! Check if you need approval for the work. This NSW LLS guideline is a decision-making tool to assist members of the community to understand and obtain approval for riparian and in-stream works, being works within and/or adjacent to a waterway including freshwater waterways, rivers, and estuaries. The guideline predominantly relates to riparian and instream works including erosion protection and remediation. You can access it here:

https://www.lls.nsw.gov.au/help-and-advice/natural-resource-management/waterways/riparian-and-in-stream-works-community-guideline



Revegetation in riparian areas is a crucial landcare practice that involves restoring native vegetation in riparian areas to reduce erosion and mitigate flood impacts.

Revegetation/Riparian Restoration to Reduce Erosion and Flood Impacts

In this training pack, we are aiming to build resilience and mitigate the risks of flooding through a focus on riparian restoration and the role that vegetation plays in riparian zones by reducing erosion.

What are riparian areas?

Riparian areas are the strips of land that border rivers, streams, lakes, or other bodies of water. These areas are characterised by their unique ecological features and diverse plant and animal communities. Riparian zones serve as transitional areas between aquatic and terrestrial ecosystems, playing critical roles in flood management.

...riparian areas play a critical role in flood management by absorbing and storing floodwaters, stabilizing streambanks, and providing habitat for wildlife...

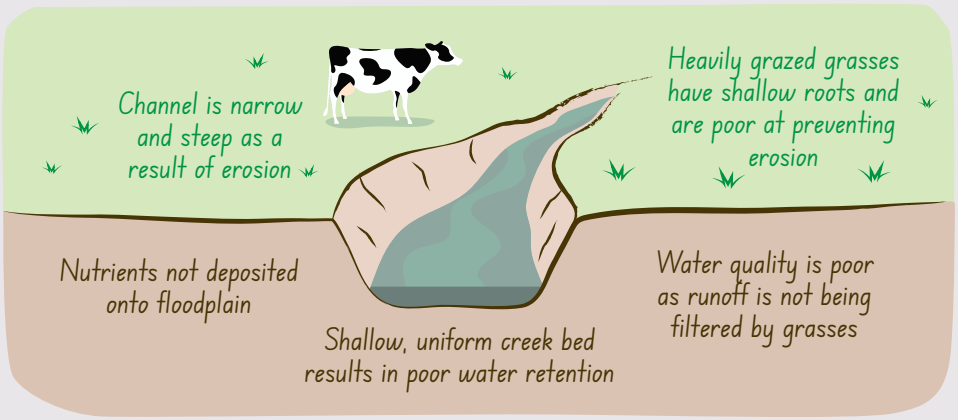
What is the role of revegetation in riparian areas?

By establishing vegetated areas along waterways, we can create riparian buffer zones that provide many benefits including:

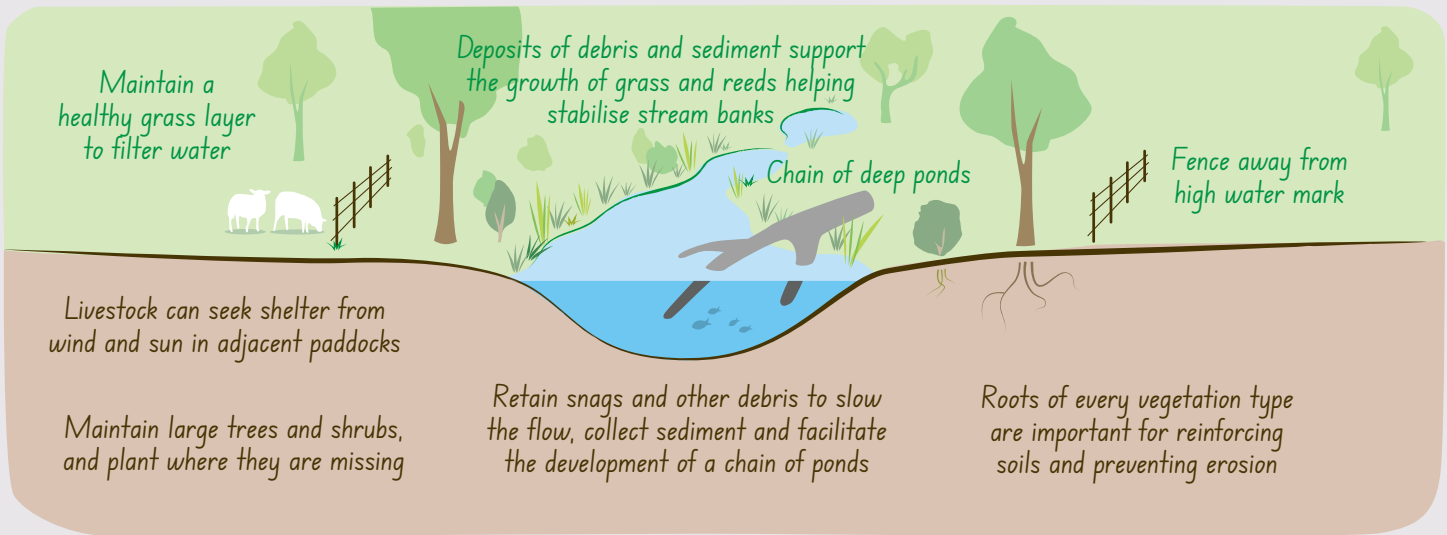
- **Soil Binding:** Native plants' extensive root networks bind soil particles, reducing erosion during heavy rainfall and floods and preventing the loss of fertile topsoil.
- **Vegetative Buffers:** Trees, shrubs, and grasses along waterways create buffers that slow water flow, trap sediments, and absorb nutrients, acting as natural barriers against floodwaters and protecting adjacent lands from erosion and waterlogging.
- **Water Absorption and Filtration:** Vegetated areas improve water absorption and filtration, reducing runoff volume and speed. Plants take up water through their roots, preventing flash flooding and filtering pollutants to enhance water quality.
- **Habitat Restoration:** Revegetation restores wildlife habitats, promoting biodiversity and ecological balance. Healthy ecosystems are more resilient to environmental stresses, including floods, and provide essential services like pollination and pest control.
- **Climate Mitigation:** Vegetation helps regulate climate by sequestering carbon dioxide and moderating temperatures. Enhancing vegetative cover in flood-prone areas contributes to climate mitigation and reduces extreme weather events.

Overall, riparian areas play a critical role in flood management by absorbing and storing floodwaters, stabilizing streambanks, and providing habitat for wildlife. Protecting and restoring these areas is essential for reducing the risk of flooding and maintaining the health of riverine ecosystems.

DEGRADED RIPARIAN AREA



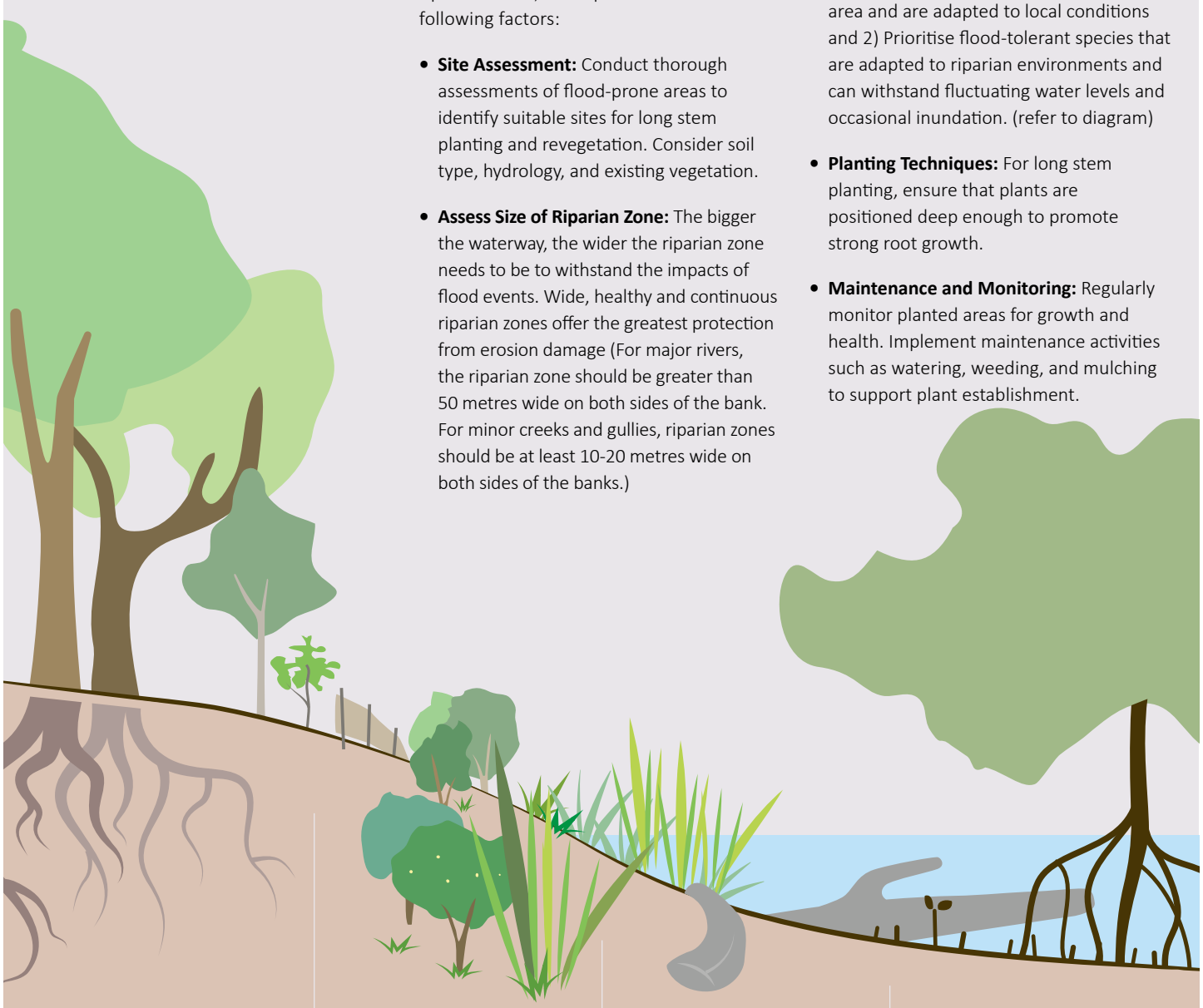
HEALTHY RIPARIAN AREA



Considerations when planting in Riparian Zones

Replanting in riparian zones requires careful consideration of various factors. While there is a concern that riparian vegetation might slow floodwaters and potentially expand the flood's reach around the rehabilitated area, research indicates that such vegetation can actually provide flood risk benefits by slowing the force of water especially on downstream floodplains. Before planting in riparian zones, it's important to consider the following factors:

- **Site Assessment:** Conduct thorough assessments of flood-prone areas to identify suitable sites for long stem planting and revegetation. Consider soil type, hydrology, and existing vegetation.
- **Assess Size of Riparian Zone:** The bigger the waterway, the wider the riparian zone needs to be to withstand the impacts of flood events. Wide, healthy and continuous riparian zones offer the greatest protection from erosion damage (For major rivers, the riparian zone should be greater than 50 metres wide on both sides of the bank. For minor creeks and gullies, riparian zones should be at least 10-20 metres wide on both sides of the banks.)
- **Include Plant Diversity:** Riverbanks/ riparian zones require a mixture of reeds, grasses, shrubs and trees that have different root types to help bind and hold the soil in place, and keep it from washing away during floods. (e.g. fibrous, tap, creeping or tuberous)
- **Species Selection:** 1) Choose native species that would naturally grow in your area and are adapted to local conditions and 2) Prioritise flood-tolerant species that are adapted to riparian environments and can withstand fluctuating water levels and occasional inundation. (refer to diagram)
- **Planting Techniques:** For long stem planting, ensure that plants are positioned deep enough to promote strong root growth.
- **Maintenance and Monitoring:** Regularly monitor planted areas for growth and health. Implement maintenance activities such as watering, weeding, and mulching to support plant establishment.



Floodplain terrace	Riparian edge	Shoreline or toe	Intertidal zone
deep rooted trees shrubs and grasses	grasses and shrubs	rushes and sedges	mangroves and saltmarsh intertidal vegetation
casuarinas, wattles, eucalyptus	lomandra	swamp rush	mangroves
leave fallen trees	exclude livestock use coir or stick fence	use bags or sand sausage	leave logs and rocks

Rushes and sedges are vital to wetlands, rivers and estuaries. They provide food and habitat for aquatic organisms, aerate sediments and filter pollutants, especially nutrients. With roots often submerged, many of these plants have developed air-filled cells called aerenchyma, allowing them to draw oxygen into their rhizomes and diffuse it into the sediments. This oxygenation supports microbial organisms that break down organic matter. Thus, many rushes and sedges promote nutrient removal from water bodies through both habitat creation and as well as by the nutrients they take up in order to grow.

Grasses and clumping plants like Lomandra, bind soil and rock, providing protection during heavy flows. Lomandra species are drought and frost tolerant, adaptable to most soil types, resilient to vehicle pollutants, fire retardant, and can survive major floods. Lomandra dissipates water during peak flows. When planted densely, their fibrous roots form mat-like structures that stabilize topsoil. After recent cyclones, Land for Wildlife members noted that weeds washed away, but Lomandra remained intact. Lomandras are ideal for landscaping steep slopes with minimal maintenance.

Trees- Tree roots prevent riverbank erosion by holding soil in place and reducing sediment movement. Overhanging foliage regulates water temperature and provides shade for fish, while fallen trees offer additional protection and habitat for native fish. Riparian zones are crucial corridors for aquatic wildlife, with diverse riverbanks supporting a healthy watercourse. Planting trees along rivers, especially on upper slopes, positively impacts aquatic wildlife and helps to support natural processes.

‘There’s been some very interesting work on the impact of lomandra in stopping erosion in the fast flow flood events. They’re just the most amazing plants. You have a shocking flood and after it the lomandra are there perfect.’

Long Stem Planting

The riparian environment poses challenges for planting native vegetation using conventional methods because the seedlings are constantly influenced by fluctuations in water levels, river flow patterns, and erosion and sedimentation processes.

Long stem planting is a critical technique used in flood prone areas to enhance the resilience of vegetation and reduce flood impacts. This method involves planting native species with elongated stems deep into the soil, promoting robust root systems and better plant stability.

The primary benefits of long stem planting include:

Enhanced Root Anchorage: Deep planting encourages extensive root growth, which helps anchor plants firmly into the soil. This stability is crucial in flood-prone areas, where strong currents and water saturation can easily uproot shallow-rooted plants.

Improved Water Infiltration: ‘Slow the Flow’- The extensive root systems of long stem plants create channels in the soil, facilitating better water infiltration and reducing surface runoff. This helps to mitigate the intensity of floods by allowing more water to be absorbed into the ground rather than accumulating on the surface.

Soil Stabilization: By securing the soil with deep roots, long stem plants help prevent erosion, which is a common consequence of flooding.

Resilience to Extreme Conditions: Plants with well-established root systems are more resilient to the stresses of flooding, including prolonged waterlogging and rapid water flow. This resilience ensures that vegetation can survive and recover after flood events, maintaining the integrity of the landscape.

Biodiversity Support: Long stem planting often involves native species that provide habitat and food for local wildlife. A biodiverse ecosystem is more resilient to environmental changes and can better withstand and recover from flood impacts.

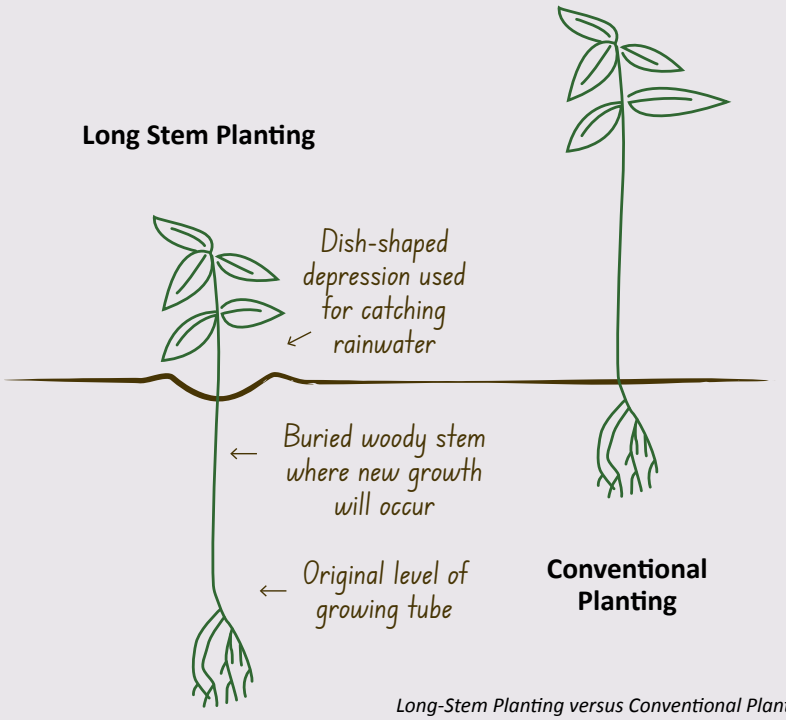
Specifics of how to do plantings:

The long-stem planting method is an innovative way of planting that can result in higher survival and growth rates with minimal post-planting care as the deep planting protects the roots from substantial changes in soil temperature, allows the plant access to deeper soil moisture and reduces competition from weeds.

You can access a video of effective flood planting- Landcare NSW- People led Prevention- Planting for Floods here: xxxxxxxxxxxxxxxxxxxxxxxxx

These are the main steps:

- Using the long-stem method, seedlings are grown in pots for 10-18 months, so that they develop long woody stems.
- In preparation for putting plants in the ground, clear away any weeds so the planted seedlings won't need to compete for space, nutrients and moisture.
- These seedlings are then planted with about three quarters of their length below the soil surface, which results in much of the woody stem being covered with soil. (When planting the seedling, ensure there is an appropriately sized hole dug for your plant, It needs to be at least up to a centimetre or two above the pot edge.



Long-Stem Planting versus Conventional Planting

- Put one fertiliser tablet and a small scoop of water crystals in the bottom.
- Fill in the hole and tap the soil down gently.
- Create a ring of soil around the plant to create a dish shaped depression to trap any rainfall.

- Put on a tree guard to protect the seedling. Tree guards used on the upper river bank protect from wind, sun, frost, and browsing herbivores (hares, wallabies, kangaroos), and can be biodegradable cardboard (better near creeks and rivers) or reusable plastic 'sleeves'.

Fencing off the Area

Livestock can cause erosion by compacting soil, creating ruts, trampling vegetation, spreading weeds and browsing native vegetation. It's important to fence off sensitive areas and restrict and manage the length of time livestock graze in the riparian zone/riverbank edge.

Fencing helps with:

- **Erosion Control:** Fences, especially those with vegetation cover, can help control soil erosion. This can prevent the loss of valuable topsoil and help stabilise the ground.
- **Guidance for Water Flow:** Properly designed fencing can help guide water flow during floods, potentially directing it away from vulnerable areas and structures.

- **Temporary Barrier:** In some cases, a sturdy fence might act as a temporary barrier against rising floodwaters, buying time for other flood protection measures to be put in place.
- **Preventing Debris Accumulation:** A solid fence can act as a barrier to debris carried by floodwaters, reducing the chances of it piling up against your structures.
- **Protection of Vegetation:** Fences can help protect vegetation and landscaping from being washed away or damaged during floods.

In flood prone areas, fencing can be difficult to manage. However, there are inexpensive electric fence options that can protect considerably large areas from livestock and be retrieved quickly prior to or after flood events. The BELLINGER river system LANDHOLDER BOOKLET has great advice on fencing waterways for livestock.

Logs and Earthworks

Using logs for erosion control on river banks helps stabilize the soil, reduce water velocity, and trap sediment, thereby preventing the river banks from washing away during floods and maintaining the integrity of the river ecosystem.

Sand Sausages!- Shoalhaven Riverwatch, led by Peter Jirgens, designed an alternative to individual sandbags- the low cost Shoalhaven Sand Sausage. The Sausage is one long continuous sandbag placed along the toe of the bank, and constructed on-site with removable frames, geotextile fabric and a sewing machine. Volunteers fill the sausage from sand or mud on-site, sew it in place and then remove the frame to the next section.

The Sausage prevents wave action from eroding the bank as well as trapping sediment from eroding banks. Over time, additional Sausages can be added on top of the earlier Sausage to further build up a stable riverbank. The Sausage is also inexpensive to construct, costing only 1/5 of the cost of conventional sandbagging. Unlike sandbags, it is not moved during flood events due to its length, flexibility and weight.

Creating swales and retention basins- Run-off management strategies which store water in upper catchment areas and benefit water storage, water filtration, habitat, carbon sequestration, sediment retention and water quality.

Building levees and embankments - constructed mainly from earth and used to confine flow within the specified area along the river and prevent/mitigate against the risk of flooding.

Soil Health

Healthy soils across the whole landscape help filter and store water, which can help to reduce the impacts of floods. When the soil is healthy, it can absorb water many times faster than conventionally managed soil. Its structure allows more water retention and means less water runs off the surface, as it does on more compacted soils. Ways to improve soil health for flood resilience:

- Using cover crops and no-till farming to increase infiltration
- Enhancing soil organic matter

Maintenance

Follow up maintenance is essential to ensure the success of any riparian revegetation project.

- One must control the weed species, particularly grasses, that will outcompete young tubestock for soil moisture and nutrients and inhibit their growth.
- Watering of revegetation following planting is often necessary for successful plant establishment. As a guide, tube stock should receive a deep watering one to two times per week for the first two weeks following planting and then once a fortnight for up to the next eight weeks.
- Mulch may be used to retain water and inhibit weed growth.

Step by Step - Practical Guide to Flood Preparation and Planting

Good planning is one of the best ways to set your project up for success. This includes making sure you have the right skills and resources, you understand what needs to happen to achieve the desired ecological outcomes, and you track the success of your project over time. First you need to observe what's going on on your property and focus on the principles of where the risks are and what you can do to mitigate those risks.

Here is a list to help get you started when identifying how to make your property more flood resilient:

1. Observe the water on your property/ slope etc
2. Work out your soil type
3. Soil testing (ph etc)
4. Fencing
5. Widen your vegetation (corridors, riverbank, garden)
6. Control Weeds
7. Leave logs and add additional materials /structural changes may be required/ physical drainage structures
8. Species selection
9. How to do planting eg tree guards, spacing, time of year, raised beds etc
10. Maintenance - how to look after new plantings - Watering, mulching

Floods and erosion are significant environmental challenges that require integrated and sustainable management approaches. Nature-based interventions form part of the solution to harness the power of ecosystems to mitigate these risks. By promoting practices such as riparian restoration, we can build resilient landscapes that protect communities, enhance biodiversity, and ensure the long-term sustainability of our natural resources. Implementing these interventions is crucial for adapting to climate change and safeguarding the environment for future generations.

Protect Your Home from Flood Risks

After going through the training pack, it's time to apply your knowledge and take proactive steps to protect your property and enhance your flood awareness. Here's what you can do next:

- Assess Your Property: Identify areas that are most vulnerable to flooding.
- Create and Implement a Flood Management Plan: Develop a comprehensive plan tailored to your property's needs.
- Implement Preventative Measures: Install barriers, improve drainage, and consider flood-proofing techniques.
- Explore Funding Opportunities: Look for grants and financial assistance programs to support your flood mitigation efforts.
- Stay Informed: Keep up-to-date with the latest flood warnings and weather updates.

Engage with your community and participate in local flood preparedness initiatives. Joining or collaborating with your local Landcare group is a great way to contribute and gain support. Landcare groups work together to access and apply for grants and undertake works.You can find and contact your local Landcare coordinator here: https://landcare.nsw.gov.au/groups

Your proactive steps can significantly reduce the impact of floods on your property. Don't wait until it's too late—start implementing these measures today to protect your home, property and livestock.

Australian Government

NSW GOVERNMENT

Landcare New South Wales

PEOPLE LED PREVENTION PROJECT

Landcare NSW's People Led Prevention project empowers communities across regional NSW in developing disaster resilience and preparedness skills. Jointly funded by the Australian and NSW Governments.