

## **SECTION 6: KEY ENVIRONMENTAL MANAGEMENT PRACTICES**

### **WATER COURSE MANAGEMENT**

#### **From drains to living streams**

Your watercourse is part of an extensive water catchment network, made up of depressions, wetlands, drains, streams and rivers that branch out to remove excess rainfall from the surrounding landscape. Water does not flow in a straight line, so natural streamlines generally ‘snake’ or meander across the land on their way to the ocean.

Unfortunately, most waterways are being used simply as a drain, with little thought to the consequences. Practices such as the clearing of fringing vegetation, uncontrolled grazing by livestock, removal of natural debris such as logs and branches, the building of piped culverts, the straightening channels to name a few have altered the natural waterway systems. Extensive networks of poorly designed, artificial drains are contributing to excessive quantities of nutrients, sediment and other types of pollutants entering our waterways.

Activities on your property are linked to others via this network of drainage. Waterways need your help. A great way to start is by wrapping them in a protective layer of vegetation.

### **BENEFITS OF HEALTHY RIPARIAN VEGETATION**

Healthy vegetation on the banks of your waterway will provide many benefits. Referred to as the ‘Riparian Zone’, the area adjacent to your waterway is vitally important to its health and provides a range of benefits as outlined below.

#### **Erosion control**

Multiple layers of vegetation protect the soil within the riparian zone of natural watercourses. A mixed canopy of trees, shrubs and other vegetation form a protective umbrella over the soil, shielding it from the direct impact of heavy rainfall. Fallen leaves and other debris mulch the soil and add another layer of protection on the surface of the soil.

Like the steel reinforcing bars in concrete, the roots of trees and large shrubs create an extensive underground structure to hold and support the banks of your watercourse together. Within this underground framework the soil is bound together by the fibrous roots of the small shrubs, sedges, rushes, herbs and grasses.

#### **Biological nutrient filter**

The erosive force of rainfall run-off entering the waterway from adjacent areas is reduced by the filtering effect of healthy riparian vegetation. This vegetative maze reduces the speed of the run off, filters out debris, manure and sediment, and increases infiltration into the soil. Once in the soil,

dissolved nutrients can be utilised by the extensive root systems of the plants or bound up by soil particles.

### **Habitat for wildlife**

The combination of water and thick protective vegetation provides the ideal conditions for a wide range of wildlife. Riparian plants provide food and shelter for both land and water-based creatures. Insects such as Dragonflies and Mayflies are drawn to the water to breed, as they must spend their larval stages in water. The sedges and rushes that often line the shore of a waterway provide a home to freshwater shrimp, beetles and small fish. The leafy vegetation on the bank is alive with insects on which spiders, lizards, birds and mammals can feast.

### **Food for aquatic creatures**

Leaves falling into the water are the primary source of food for the waterways herbivorous macro-invertebrates, who in turn become food for carnivorous invertebrates such as marron, fish, frogs and birds. Overhanging trees and shrubs provide shade to keep the water cool in the hotter summer months. Many of the aquatic creatures are sensitive to high temperatures and die without the cooling shade that the trees provide. Woody debris such as fallen trees and branches provide underwater habitats, protection from predators, shelter from fast flowing water and fish spawning sites.

### **Wildlife corridors**

Well-vegetated waterways provide protective corridors along which small birds and animals can move. In largely cleared areas, these ribbons of green are becoming increasingly important, as they are often the only links to other semi-isolated patches of remnant vegetation. Without them, populations of birds and animals are trapped and vulnerable to predation, inbreeding, food shortages, fire and other threats.

### **Human sanctuaries**

We often forget the recreational value of a healthy living stream. Every waterway is different with regional differences being provided by its unique blend of local native vegetation. People like to relax in these areas, enjoying a shady tree and admiring the scenery and associated wildlife.

*Basically, healthy riparian vegetation provides many environmental, economic and social benefits.*

## **PROTECTING AND ENHANCING YOUR LIVING STREAM**

If your riparian zone is degraded, subject to grazing or is being damaged in any way, the first step in its rehabilitation is to develop a plan of attack. Your waterway restoration project must be

integrated into your Property Plan. Think of your property as a living, breathing organism that must have all its component parts working in harmony to function properly.

*Remember your waterway is only part of a branching watery network, surrounded by many influences, so consider the wider picture when planning your work.*

### **Step 1. Who's waterway is it?**

Before you do anything you need to know who owns or manages the waterway. Even if it passes through your own property it may be a government proclaimed waterway. In general the bigger it is, the more likely that you will need permission. Your local shire council will be able to advise you on the level of permission required.

### **Step 2. Seek help**

There is a wealth of knowledge on waterway restoration built from many years of trial and error. Seek advice from others such as experienced locals, landcare groups, your local landcare coordinator, environmental consultants and government organisations such as the Swan Catchment Centre. Your local shire council will be able to provide you with a list of contacts.

*Did you know?*

Your project is likely to be eligible for landcare funding, providing up to 50% of your project costs. Think ahead and apply early (up to 12 months ahead of implementation), as these funds are often limited.

### **Step 3. Don't forget the tributaries**

It may not be practical to revegetate all the minor drainage lines that empty into your waterway but they have the potential to clog your restoration with a continual supply of sediment and nutrients if not considered. Consider realigning internal fences so that it coincides with minor drainage lines. Maybe establish a wider revegetation zone where the minor drain empties, filtering the water before it enters your waterway, effectively creating a wetland.

### **Step 4. How wide do I fence?**

Environmentally speaking, the wider the vegetative buffer the better, but any buffer is better than no buffer at all. Economically speaking, your fence is a major investment so it makes sense to locate your fence higher than the potential flood height of your waterway. When building your fence don't be lured into following the meanders of the waterway closely in a bid to limit loss of grazing land. It is far easier and cheaper to keep bends, and hence expensive strainer posts, in your fence to a minimum. Revegetating wider sections will also provide valuable shelter for stock.

**Figure 9. Towards a living stream.**

**Step 5. Revegetation**

Depending on the degree of degradation some areas may have enough native species present to naturally regenerate once fenced. However, when the impact of uncontrolled grazing is eliminated, other issues are likely to arise to hamper the revegetation of the waterway.

**Weeds and other pests**

Weeds can pose a major threat to the successful regeneration of your waterway. To give the native vegetation a chance to establish, weed and pest control measures must be introduced. You may have to resort to physical removal of weeds or the careful use of herbicides. When using herbicides follow the instructions on the label carefully and seek out 'frog friendly' formulations to limit any harmful affects to the waterway. Rabbits and kangaroo numbers need to be monitored as they can eat a large number of your lovingly planted seedlings. Tree guards may be necessary to get your seedlings through the first couple of years.

**Soil preparation - ripping and mounding**

Some soil preparation will assist revegetation, but be careful as you can easily cause an erosion zone. Ripping is essential on all agricultural soils before planting. Ripping should be to about 0.5 m or deeper where impeding layers can be profitably broken. Ripping will increase soil aeration, and this increases plant growth. Mounding should always be done on soils that are salt affected or waterlogged. Even salt and waterlogging tolerant plants are sensitive to these conditions during

establishment. Limit mounds to 10 metres in length and leave at least a 2 metre undisturbed area on which to overflow. Mounding aerates the soil, allows nutrients to collect around the seedling and raises seedling roots above the saturated and salt affected soil.

### **Planting trees and shrubs**

Select species that are native to your region in preference to species from elsewhere. Local native species are generally adapted to the local conditions and are most likely to support a wider range of local fauna. If trees and large shrubs are present, try to order mainly lower storey shrubs, as these are the species that need the most help. These shrubs will support ground living fauna and stabilise the soil along your waterway.

### **Direct seeding**

You may be lucky enough to have an area of local bush that is relatively intact. Collecting local seed and sowing it into your regeneration site can be very cost effective. Be careful to choose your collection site wisely. Pick a site similar to your own and seek help with germination tricks. Be prepared for the need for follow up weed control. Results can be highly variable but when successful it is the most effective method of restoring riparian vegetation.

### **Sedges and rushes**

Sedges and rushes are an important component of the riparian zone. They can be expensive, as they are often difficult to produce in nurseries. An alternative is to transplant from a location where they are abundant or not wanted. Some farmers regularly spray to reduce sedges and rushes in their paddocks. They are often delighted to allow you access to them. Different species have different requirements, but in general try transplanting them in late winter.

## **Step 6. Consider stock access**

To ensure healthy riparian vegetation and protect revegetated areas, stock access must be tightly controlled. The key is to use the fence to control the level of grazing so as to allow the native vegetation to regenerate and to limit soil disturbance. If your aim is to encourage a diverse, natural ecosystem then total stock exclusion is required. However be prepared for a potential explosion of weeds when grazing is removed. A fair compromise is to allow opportunistic grazing by stock. If grass weeds need to be reduced (e.g. to minimise the potential fire risk) stock could be briefly introduced in spring. In time, the shade from the canopy of the trees and shrubs will eliminate many of the early-established weed species.

### **Stock watering points and crossings**

Ideally, stock watering points should be located away from the waterway using windmills, soaks and dams. However if access to the waterway is required there are a few techniques that can limit degradation. In most cases rock will be needed to harden the approaches to the waters edge. A key

## Sustainable Land Management in the Ellen Brook Catchment

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feature is to leave the ground rough. By making it uncomfortable for the stock they will tend to drink and quickly leave rather than linger and cause degradation.

Stock watering points should be located away from steep stream banks that are prone to erosion. A better access site would be on the inside of a bend in the river where sediment is naturally deposited. Perhaps there is a stony section that could be utilised. A combination stock watering and vehicle crossing point may be possible. It should be located on slow moving straight sections between bends in the channel. Hardened with rock, these structures must be carefully designed with particular attention paid to the downstream side where most crossing disaster stories occur. Well-designed structures can be built to imitate natural riffles or rapids and become a key habitat feature in the waterway. Crossings can also function as a fire control measure by creating a gap in the continuous line of riparian vegetation.

### **Pools and riffles**

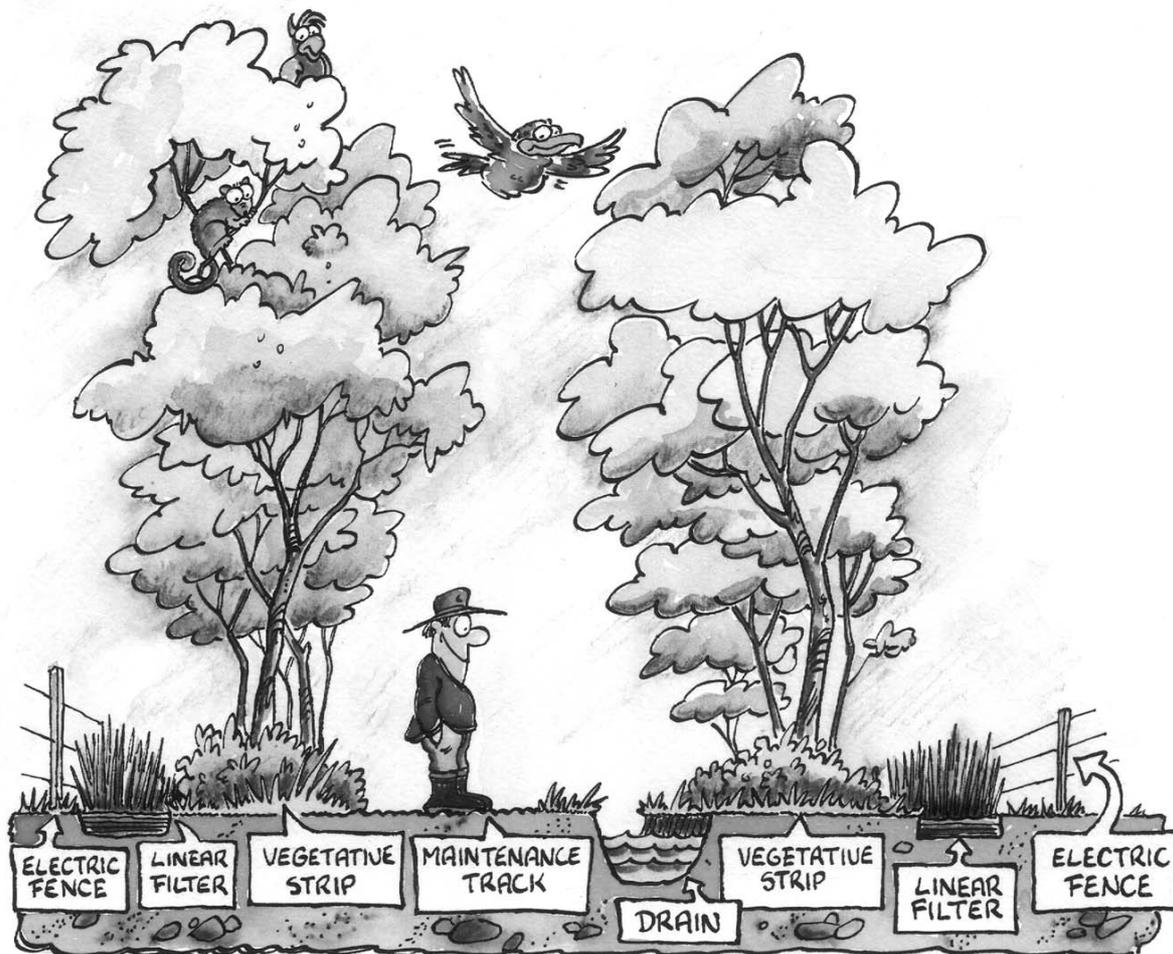
Unlike a newly constructed drain with a constant slope, a natural waterway will flow down a series of steps. Just as it is natural for water to meander, it also undulates up and down creating a stepped effect. Deeper pools will generally be formed on the bends during high flow events. In the straight sections between bends, boulders, rocks and logs will accumulate often creating riffle structures. Often the roots of trees, semi attached fallen logs, rocks and a well constructed stock crossing can provide a local pool/riffle effect in other sections of the waterway. The cascading effect caused by obstructions in the waterway will force air into the water. These riffle zones oxygenate the water and are essential for aquatic life downstream. In the deeper pools, the flow will slow and debris tends to settle. This is sometimes referred to as the stomach of the waterway because its primary role is trapping food to be digested by the resident macroinvertebrates.

### **Large woody debris**

Logs and branches can be placed in the waterway to create valuable fauna habitat, reduce erosion and oxygenate the water. Logs collected from the surrounding landscape can be placed in riffle zones. However seek advice before you commence this work as the potential to create havoc is real. The power of flowing water should not be underestimated, you might like to practice on small tributaries first.

### **Streamlining - Turning your drain into a living stream**

There is no reason why drains on your property can't be transformed into a network of babbling brooks. Streamlining is the process of modifying high maintenance artificial drainage into more natural watercourses. Comprising of fencing (only if required to control stock), revegetation, filtration systems and some in-stream structures, the process seeks to imitate nature's recipe as previously outlined above. The result is a stream to be proud of, with clear water, reduced nutrient and sediment levels, reduced erosion and a return of local wildlife.

**Figure 10. Cross sectional streamlining diagram.**

### **Wetlands - Nature's biological filtration system**

Prior to clearing, all low lying areas were part of an extensive chain of heavily vegetated wetlands. Rainfall run-off would enter the wetland where it would be subject to processes of settling, filtration, plant uptake and infiltration into the soil. Once filled it would often overflow into an adjoining wetland to undergo a similar process until it reached a major watercourse. Natural wetlands are teeming with life and are an integral part of the catchment's waterway network. All wetlands on your property need to be protected and fenced. This will allow the control of grazing needed to enhance your wetland.

### **Creating artificial wetlands**

Why not have a go at creating your own wetland? Existing depressions where water collects or the point in which drainage lines enter a waterway are ideal places to establish an artificial wetland. As a general rule, the more natural features you can add to your wetland the better it will function ecologically. So study natural systems, seek advice but have a go, as it can be very rewarding.

## **Water harvesting**

It is ironic that we have developed a drainage network designed to remove rainfall run-off as quickly as possible. We effectively curse the rainfall for two months and spend the rest of the year wishing it would rain. Dams, detention basins and artificial wetlands can be used to retain water long after the winter rains have finished. This provides you with a valuable source of water, alleviates flooding by controlling the input of run-off water into our local waterways, provides an opportunity to clean rainfall run-off and offers a new potential habitat for wildlife.

## **Further information**

General information on waterway management can be found in a wide range of sources and include the following:

### *Publications*

*Managing Our Rivers: A guide to the nature and management of streams of the southwest Western Australia*, by Dr Luke J. Pen.

*Streamlining: An environmentally sustainable drainage network for the Swan Coastal Plain (Peel Harvey Catchment)*, by G. Heady and N. Guise.

*Living Streams: A guide to bringing watercourses back to life in south-west Western Australia*, by Dr Luke Pen and Karen Majer.

Waternote Series: Advisory notes for land managers on river and wetland restoration, by the Water and Rivers Commission. Also available on Internet site: [www.wrc.wa.gov.au/public/WaterNotes](http://www.wrc.wa.gov.au/public/WaterNotes).

*For more information contact:*

Agriculture Western Australia  
36 Railway Parade, Midland  
Ph: (08) 9274 5355

Swan Catchment Centre  
108 Adelaide Terrace, Perth  
Ph: (08) 9221 3840

## **VEGETATION AND REMNANTS**

Western Australia is one of the most biologically diverse areas on the planet. It boasts a unique suite of flora and fauna found nowhere else on earth. The Ellen Brook Catchment, with its diverse range of habitats is certainly one of the jewels in this crown. It contains a wide range of natural environments starting with the Jarrah forests of the Darling Plateau, to the *Banksia* woodlands of the Dandaragan Plateau and several others on the Swan Coastal Plain.