



# ORARA RIVER REHABILITATION PROJECT LANDHOLDER BOOKLET

**ORARA VALLEY RIVERCARE  
GROUPS MANAGEMENT  
COMMITTEE INC**



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This booklet has been produced with funding from the NSW Environmental Trust; the Northern Rivers Catchment Management Authority; and Coffs Harbour City Council, in partnership with:

- Orara Valley RiverCare Groups Management Committee Inc
- Urumbilum Cochrans Pool RiverCare Group
- Karangi LandCare Group
- Nana Glen LandCare Group
- Orara Valley Progress Association
- Coffs Harbour Regional LandCare

Thank You to all Project Partners for their input into the booklet.

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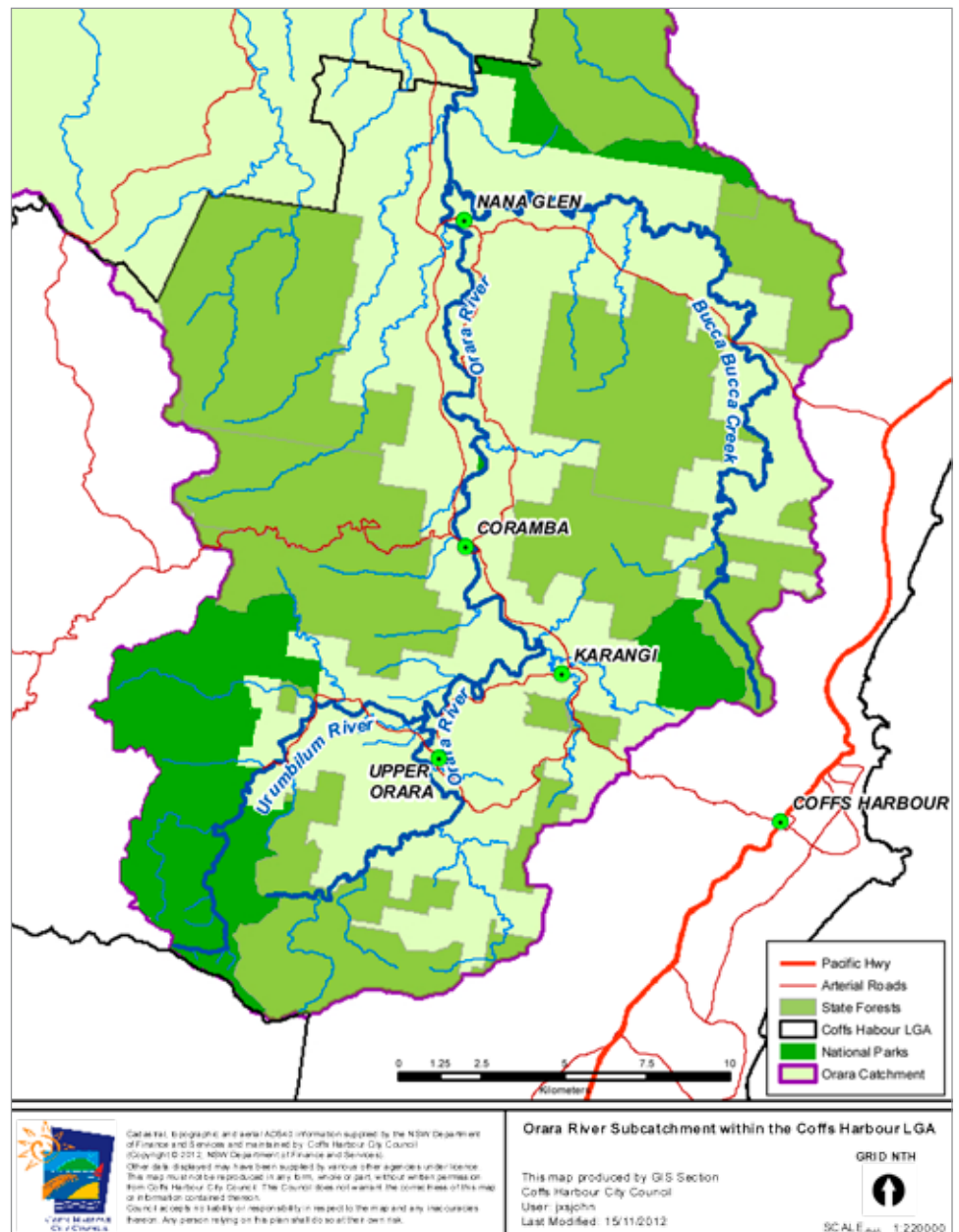
# HISTORY OF THE RIVER & ORARA RIVER REHABILITATION PROJECT

## LOCATION

The Orara Valley is located west of Coffs Harbour on the NSW Mid North Coast, approximately 90m above sea level. The valley is a sub catchment of the greater Clarence River system which is the largest coastal river system in south eastern Australia.

The main rivers and creeks within the sub catchment include:

- ▶ Orara River, which runs from Upper Orara to the Coffs Harbour LGA boundary just north of Nana Glen;
- ▶ Urumbilum River which runs from Dairyville to meet the Orara River at Upper Orara; and
- ▶ Bucca Bucca Creek, which runs from Bucca to meet the Orara River at Nana Glen.



## HISTORY

### Landscape

The Orara Valley is within the land of the Gumbaynggirr people. The valley forms a sub catchment of the greater Clarence River system, including the Orara River, Urumbilum River, Bucca Bucca Creek and their tributaries. Well forested hillslopes are often within National Park and State Forest lands.

Native vegetation along the rivers and creeklines mainly consists of Lowland Rainforest of Subtropical Australia which is an Endangered Ecological Community. The river and forest is important habitat for vulnerable and endangered fauna species, including the Wompoo Fruit Dove, Rose Crowned Fruit Dove, Bush Hen, Eastern Freshwater Cod, Giant Barred Frog, Tiger Quoll, and Grey Headed Flying Fox.

### Aboriginal Significance

The project area is of very high significance to the local Aboriginal people of the Gumbaynggirr country. The name "Orara" comes from the Gumbaynggirr word "Yuraara", meaning place of food. The river is particularly known as Bindarray Bugambala (River of Perch). The entire valley was considered a very rich resource area. Important cultural sites are widespread throughout the valley and along the rivers and creeks. These sites are essential to cultural practices to preserve biodiversity and ensure the continued rejuvenation of natural resources in the project area.

### Recent History

The first Europeans to arrive in the region in the mid 1800s were the cedar getters who worked their way up the Orara River and reached Coramba in 1875. This in turn opened up the way for land selection in the area. The discovery of gold in 1895 led to the establishment of a number of mines. The discovery of gold also resulted in demand for food and other resources to supply the mining community and led to further development of agriculture in the area. Currently the main agricultural activity is beef farming with some orchards and cropping.

Land use practices such as clearing and gravel extraction have resulted in the loss of native vegetation and erosion. A degraded river channel and banks lead to an increase in the velocity of floodwaters, leading to increased erosion and sedimentation in stream. Weed invasion impacts upon the biodiversity of native vegetation and loss of fauna habitat in the valley.

## THE ROLE OF LANDCARE GROUPS IN RIVER REHABILITATION

In 1996 a number of Landholders from several communities across the district independently formed LandCare Groups to begin addressing degradation of the Orara River, Urumbilum River, Bucca Bucca Creek, and their tributaries. In 1998 the Orara Valley RiverCare Groups Management Committee Inc (OVRGMC) formed as an umbrella group for the local LandCare groups in the area.

- |   |                |              |
|---|----------------|--------------|
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| ▶ Karangi LandCare Group                  | Ron Smith      | ph 6653 8249 |
| ▶ Nana Glen LandCare Group                | Peter Franklin | ph 6654 3452 |

### **Project Partners** include:

- ▶ Orara Valley RiverCare Groups Management Committee Inc
- ▶ Orara Valley Progress Association
- ▶ Coffs Harbour City Council
- ▶ Northern Rivers Catchment Management Authority
- ▶ Coffs Harbour Regional LandCare
- ▶ NSW Environmental Trust
- ▶ NSW Dept of Industry & Investment
- ▶ Federal government Caring for Country program
- ▶ GreenGrid (TransGrid & Greening Australia).

Substantial ongoing funding has been provided for the project from the Coffs Harbour City Council Environmental Levy since 1997; Northern Rivers Catchment Management Authority since 2004; and more recently from the NSW Environmental Trust.

# THE NATURAL ENVIRONMENT

## CLIMATE

The climate is subtropical with typically dry winters and wet summers. Compared to the rest of Australia, the area experiences exceptionally high rainfall. The wettest month tends to be March with a mean rainfall of approximately 200mm. The driest month tends to be August with a mean rainfall of 50mm.

Summer maximum daily temperatures average around 28°C with overnight minimums averaging around 17°C. Winter maximum daily temperatures average around 20°C with overnight minimums averaging around 5°C. The riparian zone is subject to frost after particularly cold winter nights.

## GEOLOGY & SOIL

Bedrock is low rank Paleozoic metamorphic rock. This is sedimentary rock originally deposited on the sea floor that has been altered by temperature and pressure during burial.

The flood plain soils are highly erodible being composed of clayey, silty and gravelly alluvial material, layered with gravels, and with cobbles and stones in some areas.

Periodic flooding on the often poorly drained flood plains and a water table that is close to the surface exacerbates the erosion hazard.

## RIPARIAN VEGETATION

Vegetation along riverbanks, creeklines and around wetlands is named riparian vegetation. As such this booklet covers riparian vegetation in particular. Details of our local riparian vegetation type are contained further on.

## VEGETATION CORRIDORS

Riparian vegetation in the Orara Valley and Bucca forms corridors which link to well forested hill slopes under National Parks and State Forest tenures, contributing to the conservation of biodiversity at the landscape scale.

Vegetation corridors are important wildlife habitat allowing animals to travel from one patch of native forest to another. A corridor provides shelter, food and protection from predators. Birds, reptiles, amphibians, mammals and insects that would otherwise be isolated in one native forest patch, can utilise corridors to move between patches with relative ease and safety.

## NATIVE VEGETATION TYPE

The main riverbank vegetation is Lowland Subtropical Rainforest. This rainforest which occurs covers less than 1,000 hectares on floodplains in NSW. Remaining stands are small and isolated.

Generally 20-30m tall with a closed canopy of 70% cover or more, the forest is very rich and can contain more than 40 tree species at some locations. Trees emerging out of the main canopy may be up to 40-50m tall with large spreading crown. Typical emergent trees include Figs, Pepperberries, Yellow Carrabeens, and Flooded Gums.

On the riverbank the rainforest is dominated by:

- ▶ Water Gum (*Tristainiopsis Laurina*)
- ▶ River Oak (*Casuarina Cunninghamiana*)
- ▶ Lilli Pilli (*Acmena smithii*)
- ▶ Brush Cherry (*Syzigium australe*)
- ▶ Creek Sandpaper Fig (*Ficus coronata*)

The main canopy can contain the following species:

- ▶ Black Booyong (*Argyrodendron actinophyllum*)
- ▶ Bolly Gum (*Neolitsea australiensis*)
- ▶ Brush Cherry (*Syzigium australe*)
- ▶ Cudgerie (*Flindersia schottiana*)
- ▶ Flooded Gum (*Eucalyptus grandis*)
- ▶ Giant Water Gum (*Syzigium francisii*)
- ▶ Guoia (*Guoia semiglauca*)
- ▶ Hairy Walnut (*Endiandra pubens*)
- ▶ Hard Quandong (*Elaeocarpus obovatus*)
- ▶ Jackwood (*Cryptocarya glaucescens*)
- ▶ Maidens Blush (*Sloanea australis*)
- ▶ Native Tamarind (*Diploglottis australis*)
- ▶ Oliver Sassafras (*Cinnamomum oliveri* (Oliver Sassafras))
- ▶ Pepperberry (*Cryptocarya obovata*)
- ▶ Red Bean (*Dysoxylum mollissimum*)
- ▶ Red Cedar (*Toona australis*)
- ▶ Rose Walnut (*Endiandra discolor*)
- ▶ Rosewood (*Dysoxylum fraserianum*)
- ▶ White Beech (*Gmelina leichhardtii*)
- ▶ White Booyong (*Heritiera trifoliolata*)
- ▶ Yellow Carabeen (*Sloanea woolsii*)



## WHY REHABILITATE THE RIVER

Past gravel extraction, flood mitigation works, and land clearing has resulted in damage to the structure of the riverbanks and beds.

Over the years structural erosion control works have been constructed at many sites. Currently, more common river rehabilitation measures are:

- ▶ management of stock access through fencing and the provision of off stream watering points; and
- ▶ regeneration of native vegetation, including weed control and revegetation plantings.

These measures provide the following benefits.

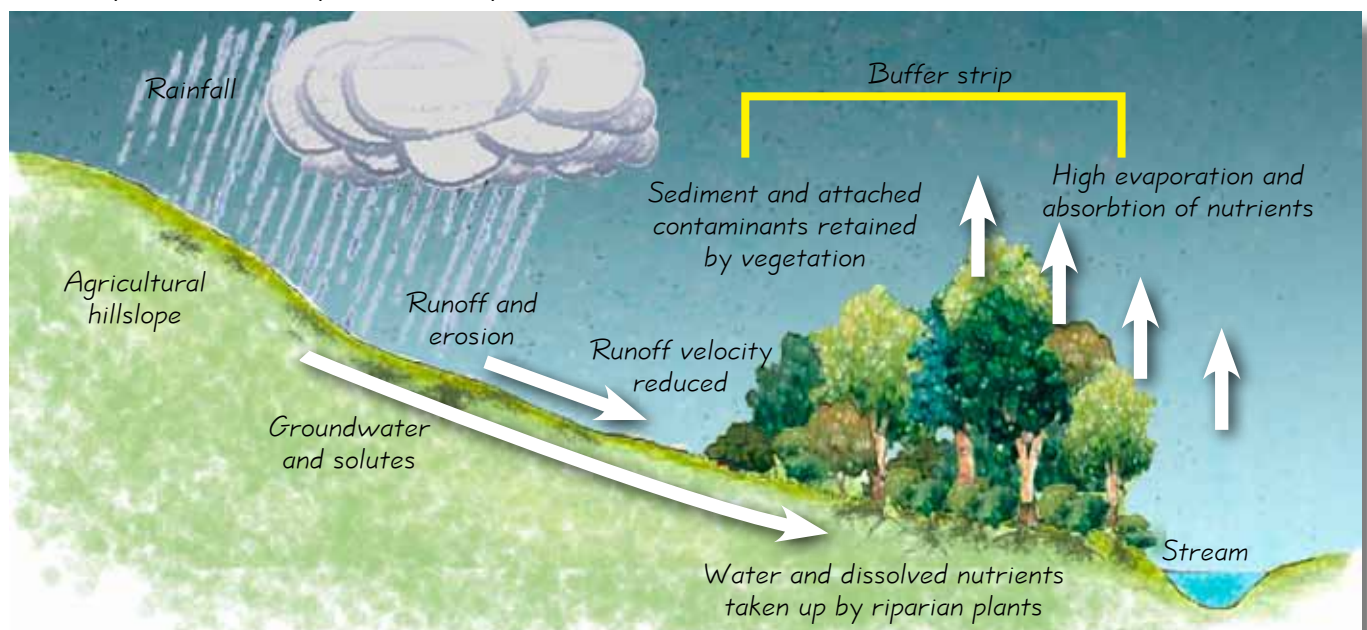
### BANK STABILISATION

- ▶ Removal of riverbank vegetation leads to damage by stock grazing and hooves compacting soil;
- ▶ Fibrous roots of native vegetation binds soil together; and
- ▶ Vegetation slows down of floodwaters to reduce the force of water flow on banks.

### IMPROVED WATER QUALITY

- ▶ erosion control, as above;
- ▶ vegetation trapping sediment which would otherwise run into creeks and rivers;
- ▶ vegetation trapping moisture to improve soil health and decrease erosion due to soil drying;
- ▶ vegetation filtering out animal effluent, fertilizers and chemicals which would otherwise run into watercourses and lead to the growth of nuisance plants and algae; and
- ▶ vegetation shading watercourses, reducing light and water temperature levels, which otherwise may result the growth of nuisance plants and algae;

*How a riparian buffer strip functions to protect the stream from contaminants.*



## IMPROVED FARM PRODUCTIVITY AND LAND VALUES

- ▶ erosion control;
- ▶ Improved water quality;
- ▶ Healthier stock due to less exposure to water borne parasites and diseases, and less incidence of hoof disease such as foot rot;
- ▶ Healthier stock with more efficient growth due to easy access to paddock watering points, rather than stock travel greater distances, often over rougher ground, to access river water;
- ▶ Vegetation providing shade for stock and reducing the impact of high winds on stock and crops;
- ▶ Vegetation providing habitat for insect-eating birds which help protect stock, pastures and crops from damage;
- ▶ Aesthetic quality of landscapes including riverbanks vegetated with diverse native vegetation; and
- ▶ Anecdotal evidence from real estate agents suggests that well vegetated riparian frontage can add up to 10% to the market value of a rural property.

## IMPROVED BIODIVERSITY CONSERVATION

- ▶ Protection of existing native vegetation, by weed control removing smothering weeds from existing vegetation and new seedlings;
- ▶ Revegetation Planting reinforcing areas of native vegetation, using local native plants propagated from seed collected from the district;
- ▶ Reinforcing vegetation corridors along riverbanks, creeklines; and along fencelines, connecting to well forested hillslopes in National Parks and State Forests;
- ▶ Reduced light and temperature levels in watercourses, maintaining good habitat for aquatic animals, including water bugs and the fish that feed on them;
- ▶ Improved wildlife habitat, allowing ease of movement by native animal species through corridors.

# STRATEGIES FOR RIVER REHABILITATION

## THE ORARA RIVER REHABILITATION PROJECT APPROACH

The Orara River Rehabilitation Project has worked for more than a decade to carry out Structural Erosion Control Works and Rainforest Regeneration Works in the Orara Valley.

Staged Weed Control has taken place to promote the growth and regeneration of rainforest plants. Camphor Laurel control is carried out with particular care to avoid impacts of falling trees and excessive debris from dead weed trees in the river. Single Camphor Laurels trees are controlled particularly in areas where they are suppressing the growth of previously healthy rainforest trees.

Understorey weeds are also controlled in a staged process so as not to cause erosion from the excessive control of vegetation from riverbanks. A staged process allows for the gradual natural regeneration of rainforest. Where natural regeneration does not occur, revegetation planting is undertaken so that native vegetation eventually suppresses invasive weeds.

## ON GROUND WORK

### Site Selection

To sustain the benefits healthy on farm native vegetation, wherever possible:

#### **MAINTAIN SITES OVER 20M WIDTH**

Avoid a too narrow area which is easily invaded by weeds and impacted by flooding and farm run off. At the very least the area should be a minimum 10m. The wider the area the more resilient the vegetation will be.

#### **ACHIEVE 75% SHADE ACROSS WATERCOURSES**

Remembering that for an east to west running stream, most shade is provided from the northern bank, so if possible prioritise this bank for work.

#### **START STOCK MANAGEMENT AND WEED CONTROL IN AREAS IN GOOD CONDITION OR CLOSE BY**

To maximize effectiveness by building upon existing stands of vegetation and areas where natural regeneration is already occurring.

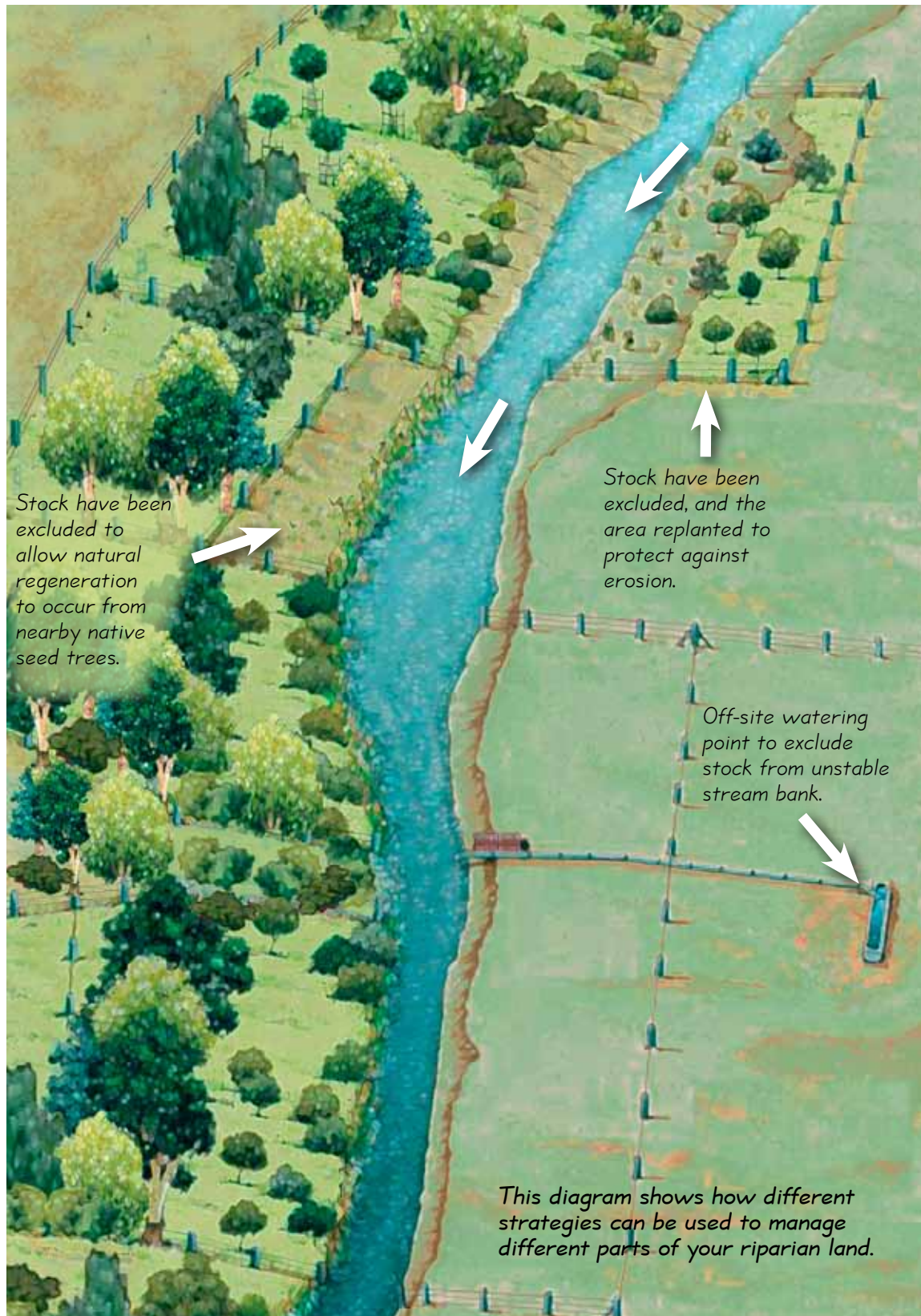
#### **UNDERTAKE REVEGETATION PLANTING TO REINFORCE AREAS IN GOOD CONDITION, OR AREAS WHERE YOU HAVE ALREADY BEGUN WORK**

Also to maximize effectiveness by building upon existing stands of vegetation and areas where natural regeneration is already occurring.



**CAREFULLY CONSIDER SITE MAINTENANCE REQUIREMENTS, SUCH AS MAINTENANCE OF FENCES AND FOLLOW UP WEED CONTROL**

So that you do not overstretch your time and resources. In areas of heavy weed infestation you will need to consider working over a much smaller area at the outset, gradually working over a larger area.





## VEGETATION REGENERATION

### The Process of Rainforest Regeneration

1. Retain and Protect existing vegetation;
2. Weed Control to allow the natural regeneration of rainforest seedlings from the existing soil seed bank and from nearby seed sources; and
3. Revegetation Planting in areas where natural regeneration is not taking place, using local provenance plant species grown from seed collected within the valley.

### Target Condition

Vegetation will be considered to be in Target Condition when:

- ▶ The immediate seed sources of major infesting weeds are removed and there are no seed producing mid/upper canopy weed species within the zone;
- ▶ Stock impacts to the site are reduced or minimised to the point where understorey native plants (such as Lomandra) can establish without being continually grazed.
- ▶ There is sufficient existing native canopy cover (50-100%) to shade out and suppress weed infestation (e.g. if the native canopy is thick enough, juvenile privet will stay suppressed as an understorey ground cover and will not produce seed); and
- ▶ Areas that have been replanted with native seedlings or have native regeneration after total canopy clearing have a survival rate of at least 1 plant per 5m<sup>2</sup> after two seasons and that competing weed species regeneration is controlled. Plantings must survive at least two winters to be considered suitably established and must be able to provide enough canopy cover to reduce weed regeneration (i.e. 50-100% at 2m high).

### Natural Regeneration

Natural regeneration refers to the natural regrowth of native species from seeds within the existing soil profile or seeds brought by birds, bats or the wind from nearby vegetation in good condition.

This results in the regeneration of vegetation composed of locally appropriate and often diverse plant species. Natural regeneration preserves local genetics and helps maintain biological diversity. For these reasons natural regeneration, where conditions indicate it will be successful, is always preferred over revegetation.

### Basic principles of natural regeneration:

1. Work from areas with vegetation in good condition (least weeds) to areas in worse condition (least natives) for more effective long term results.
2. Disturb the soil as little as possible. This principle recognises the fact that disturbed ground favours the growth of weeds.
3. Carry out gradual weed control in response to the rate of natural regeneration, so that weeds do not regrow in areas exposed to light by excessive weed control completed before natural regeneration occurs.
4. Smaller areas under frequent weed control often display better progress towards Target Condition in the long term than infrequent weed control in larger areas.
5. If working in a large area, divide it into management zones to make the work more efficient and manageable.

## WEED CONTROL

### Priority Weed Species

#### **CATS CLAW CREEPER (*MACFADYENA UNGUIS-CATI*)**

**Origin:** Central America, the Caribbean, Tropical South America

**Habit:** Woody Climber or Creeper that is very rampant, with tuberous root system.

#### **DISTINGUISHING FEATURES**

- ▶ a rampant climber with stems that eventually become very robust and woody in nature;
- ▶ oppositely arranged leaves consist of two leaflets and a distinctive three-clawed tendril;
- ▶ very showy yellow flowers are tubular (4-8cm long) with five petal lobes;
- ▶ mature fruit are dark brown and strap-like in appearance (15-50cm long & 8-12mm wide);
- ▶ fruit contain numerous papery, winged seeds.

#### **CONTROL MEASURES:**

- ▶ Cut Stump method using Glyphosate 360 mixed at a rate of 83mls to each litre of water applied to all stems.
- ▶ Cut stems as close to the ground as possible and paint the chemical on within 15 seconds of cutting.
- ▶ Regrowth will occur from the underground tubers. Don't allow the regrowth to reach host tree's foliage. Regrowth is best treated with a foliar spray.
- ▶ Digging the tubers out is not practical in most cases. Be prepared to continue control over the next five years



Habit



Leaves



Flowers

### **BROAD LEAF PRIVET (*LIGUSTRUM LUCIDUM*)**

**Origin:** East Asia

**Habit:** Tree to 10m

#### **DISTINGUISHING FEATURES:**

- ▶ Leaves (7-14cm), oppositely arranged, glossy dark green above, pale green below.
- ▶ Flowers, small (4-6mm) white with 4 petals.
- ▶ Fruit a berry (4-6mm), purple/black when mature.

#### **CONTROL METHODS:**

- ▶ Cut saplings to ground level and paint immediately with 100% Glyphosate.
- ▶ Stem inject large trees with 100% Glyphosate.



Leaves



Flowers



Mature Fruit

### **SMALL LEAF PRIVET (*LIGUSTRUM SINENSE*)**

**Origin:** China

**Habit:** Shrub to 5m

#### **DISTINGUISHING FEATURES:**

- ▶ Leaves (2-4cm), oppositely arranged, glossy dark green above, pale green below. New growth may be hairy.
- ▶ Flowers, small (4-6mm) white with 4 petals and clustered.
- ▶ Fruit a berry (4-6mm), purple/black when mature.

#### **CONTROL METHODS:**

- ▶ Cut saplings to ground level and paint immediately with 100% Glyphosate.
- ▶ Stem inject large trees with 100% Glyphosate.



Leaves



Flowers



Mature Fruit



### **CAMPBOR LAUREL (*CINNAMOMUM CAMPHORA*)**

**Origin:** East Asia

**Habit:** Tree to 20m

#### **DISTINGUISHING FEATURES:**

- ▶ Leaves (5-11cm long; 2-5cm wide), alternately arranged, glossy on upper surface, with aromatic camphor smell when crushed;
- ▶ Bark greyish, with numerous fissures.
- ▶ Flowers, small (approx 3mm) white with 6 petals;
- ▶ Fruit a berry (approx 10mm) shiny black when mature.

#### **CONTROL METHODS:**

- ▶ Cut saplings to ground level and paint immediately with 100% Glyphosate.
- ▶ Stem inject large trees with 100% Glyphosate.



Leaves



Flowers



Mature Fruit

### **BROAD LEAVED PASPALUM (*PASPALUM MANDIOCANUM*)**

**Origin:** South America

**Habit:** Broad Leaved Grass with weakly clumped growth habit.

#### **DISTINGUISHING FEATURES:**

- ▶ Up to 1m tall, but is generally less than 50cm in height. Clumps are up to 1m wide;
- ▶ Leaf blades (10–30cm long; 8–20mm wide);
- ▶ Lower parts of the stems produce roots where they contact the ground, resulting in the radial spread of clumps;

#### **CONTROL METHODS:**

- ▶ Foliar spraying, particularly effective in winter before flowering and seed set.



Habit



Leaves



Flowers



## **MADIERA VINE (*ANREDERA CORDIFOLIA*)**

**Origin:** South America

**Habit:** Ground Cover

### **DISTINGUISHING FEATURES:**

- ▶ a vigorous climber
- ▶ heart-shaped leaves are wide, fleshy, and light green
- ▶ flower spikes are 10cm long, with numerous individual small flowers, resembling a lamb's tail, producing dense blankets of creamy flower spikes from December to April
- ▶ produces thousands of small light-brown or green potato-like tubers along the stems which fall to the ground and sprout

### **CONTROL METHODS**

- ▶ Avoid pulling or cutting the vine stems as this results in fertile tubers dropping to the ground.
- ▶ Firmly scrape sections about 30cm long along the vine, exposing the inner part of the stem. Start from ground level and work on all stems as high as can be reached.
- ▶ As you scrape, immediately paint each exposed section with 100% Glyphosate.
- ▶ Vines and aerial tubers can then be left to decompose in the canopy.
- ▶ Most importantly, follow up this procedure for any vine stems that have been omitted.
- ▶ Sprouted tubers on the ground, can be carefully (and painstakingly) collected and bagged, ensuring the entire tuberling is collected.
- ▶ For ground regrowth, spray the tuberling leaves on a regular basis, 1 part Glyphosate to 50 parts water. The addition of Brush-off® (Metasulfuron) to glyphosate solutions is very effective.
- ▶ Large tubers can be poisoned in the ground by gouging a hole in the tuber and filling this with 100% Glyphosate.
- ▶ To reduce further spread lay vine and tubers on a tough plastic sheet in a cleared area.
- ▶ Cover tightly with black plastic sheeting and check periodically. (Spraying vine pieces with the above Glyphosate water mix is an option), decompose in a covered drum of water.
- ▶ Avoid rubbish dumping or taking contaminated soil or material to the tip - this only spreads Madeira Vine.



Habit



Leaves



Tubers

## Weed control methods

**Herbicides are commonly used for controlling weeds in agricultural and non-agricultural situations.** Numerous forms of application techniques and equipment are available to apply herbicides. The appropriate option will be determined by the size of the infestation, the available resources, access and personal preferences. The most commonly used application techniques are listed and described below. Always remember to read the product label and any relevant permit before use.

The following section has been taken from the Noxious and Environmental Weed Control Handbook published by NSW Industry and Investment (formerly the NSW DPI). Please refer to the booklet for more in-depth information on environmental weed control.

### CUT & PAINT

Here the plant is cut off completely at its base (no higher than 15cm from the ground) using a chainsaw, axe, brush cutter or machete (depending on the thickness of the stem/trunk). A herbicide solution is then sprayed or painted on to the exposed surface of the cut stump emerging from the ground, with the objective of killing the stump and the root system.

It is imperative that the herbicide solutions are applied as soon as the trunk or stem is cut. A delay of more than 15 seconds between cutting and applying the chemical will give poor results. Two operators working as a team can use this method effectively. The herbicide can be applied from a knapsack, or with a paintbrush, drench gun or a hand spray bottle. It is a good idea to use a brightly colored dye in the solution to mark the stumps that have been treated.

This method has the appeal of removing the weed immediately, and is used mainly for trees and woody weeds.

NB. Cut the stem as close as possible to ground level to achieve best results.



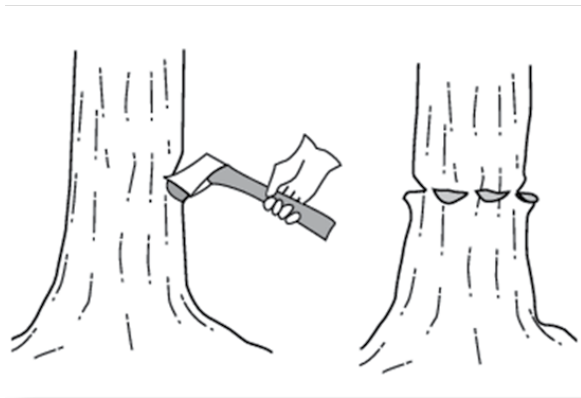
## STEM INJECT

These methods involve drilling or cutting through the bark into the sapwood tissue in the trunks of woody weeds and trees. Herbicide is immediately placed into the hole or cut. The aim is to reach the sapwood layer just under the bark (the cambium growth layer), which will transport the chemical throughout the plant.

It is essential to apply the herbicide immediately (within 15 seconds of drilling the hole or cutting the trunk), as stem injection relies on the active uptake and growth of the plant to move the chemical through its tissues.

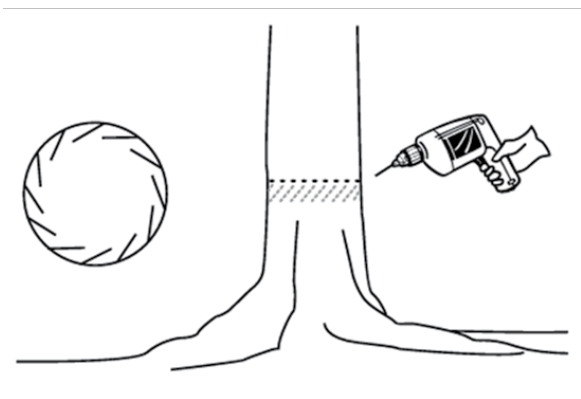
Stem injection methods kill the tree or shrub where it stands, and only trees and shrubs that can be safely left to die and rot should be treated this way. If a tree is to be felled, allow it to die before completely felling.

### STEM INJECTION – AXE CUT (OR TREE FRILLING) METHOD



Use a heavy tomahawk to make 3cm deep cuts into the trunk at waist height or lower. While the tomahawk is still in the cut, lean the top outwards (away from the tree) to open up pockets. Fill the pocket with herbicide immediately after inflicting each cut, i.e. in less than 15 seconds. Repeat these steps as you circle around the trunk at two level with pockets offset from each other, as per illustration.

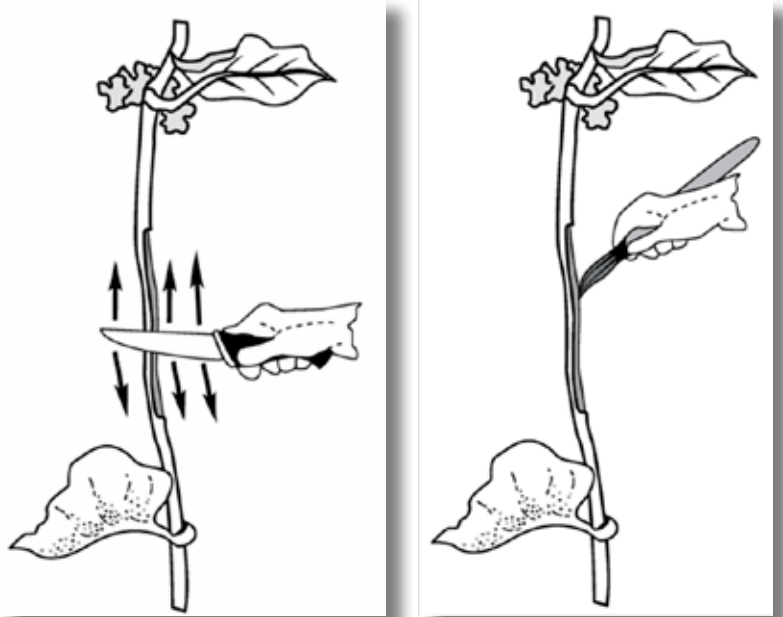
### STEM INJECTION – DRILL & FILL METHOD



This stem injection method is used for trees and woody weeds with stems or trunks greater than 5cm in circumference. The method uses a battery powered drill with an 8mm drill bit to make downward angled 3cm deep holes into the sapwood, approximately 5cm apart. Then immediately fill the holes with herbicide, i.e. in less than 15 seconds.

## STEM SCRAPE

Stem scraping is used for vines. A sharp knife is used to scrape a very thin layer of bark from a 15–30cm section of the stem. Herbicide is then immediately applied to the exposed soft underlying green tissue. This method is also called bark stripping or stem painting. With some woody weeds you can also peel away the bark surface and paint the exposed wood or spray it with herbicide.



## FOLIAR SPRAYING

Foliar spraying is the use of herbicide diluted with water or diesel at a specific rate, and sprayed over the foliage to the point of runoff (until every leaf is wetted, but not dripping). This method is most suited to shrubs, grasses and dense vines less than 6m tall so that complete coverage is achieved.

Advantages include quickness and economy. Disadvantages include the potential for spray drift and off-target damage. Foliar spraying can be done a number of ways, depending on the size of the weed plant and/or the infestation.



## REVEGETATION PLANTING

In areas where natural regeneration does not occur then planting of locally indigenous plant species is recommended. Please only use plants propagated from seed collected from the local area in order to maintain local genetic diversity. The Orara River Rehabilitation Project Officer can put you in touch with local suppliers.

Please note that these lists are not exhaustive but show plants which are readily available from Coffs Harbour City Council Nursery and local nursery suppliers. If in doubt about what to plant where, please contact your local LandCare or RiverCare Group.

### Native Plants for River Banks and Creek Lines

#### Waters Edge (Bank Toe) & Islands

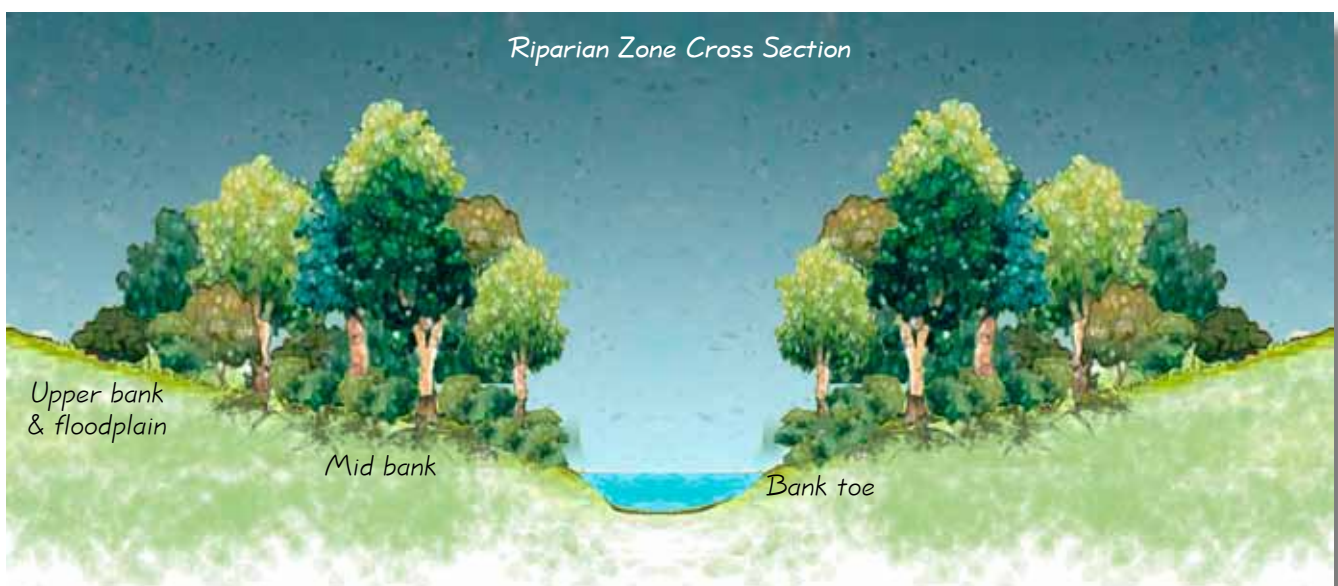
River Mat Rush (*Lomandra hystrix*)  
 River Oak (*Casuarina cunninghamia*)  
 Water Gum (*Tristainiopsis laurina*)

#### Mid Bank

Water Gum (*Tristainiopsis laurina*)  
 Brush Cherry (*Syzigium australe*)  
 Lilli Pilli (*Acmena Smithii*)  
 Creek Sandpaper Fig (*Ficus coronata*)  
 Guoia (*Guoia semiglauca*)  
 Bangalow Palm (*Archontophoenix cunninghamiana*)  
 Weeping Bottlebrush (*Callistemon salignus*)  
 (NB – for Bucca Bucca Creek Only)

#### Upper Bank & Floodplain

Jackwood (*Cryptocarya glaucescens*)  
 Black Apple (*Planchonella australis*)  
 Native Tamarind (*Diploglottis australis*)  
 Giant Water Gum (*Syzigium francisii*)  
 Olivers Sassafras (*Cinnamomum oliveri*)  
 White Beech (*Gmelina leichhardtii*)  
 Coachwood (*Ceratopetalum apetalum*)  
 Pepperberry (*Cryptocarya obovata*)  
 Rose Walnut (*Endiandra discolour*)  
 Small Leaved Fig (*Ficus obliqua*)



## **Native Plants for Farm Dams, Wetlands and Depressions in Paddocks**

Bangalow Palm (*Archontophoenix cunninghamiana*)

Brush Cherry (*Syzigium australe*)

Creek Sandpaper Fig (*Ficus coronata*)

Giant Water Gum (*Syzigium francisi*)

Guoia (*Guoia semiglauca*)

Lilli Pilli (*Acmena Smithii*)

Native Daphne (*Pittosporum undulatum*)

Paper Bark (*Melaleuca ericifolia*)

River Mat Rush (*Lomandra hystrix*)

River Oak (*Casuarina cunninghamia*)

Water Gum (*Tristainiopsis laurina*)

Weeping Bottlebrush (*Callistemon salignus*) (NB – for Bucca Bucca Creek Only)

## **Paddock Trees & Wind Breaks**

Paddock Trees are best planted in clumps so that growing plants provide protection for each other and are more resilient to frost, flooding, and insect attack. Here are some suggestions.

Brush Cherry (*Syzigium australe*)

Giant Water Gum (*Syzigium francisi*)

Guoia (*Guoia semiglauca*)

Lilli Pilli (*Acmena Smithii*)

Native Daphne (*Pittosporum undulatum*)

River Oak (*Casuarina cunninghamia*)

Shiny Sandpaper Fig (*Ficus fraserii*)

Water Gum (*Tristainiopsis laurina*)

White Booyong (*Argyrodendron trifoliolatum*)

Jackwood (*Cryptocarya Glaucescens*)

## **Plants for Under Electricity Easements**

Brush Cherry (*Syzigium australe*)

Green Wattle (*Acacia irrorata*)

Lilli Pilli (*Acmena Smithii*)

Native Daphne (*Pittosporum undulatum*)

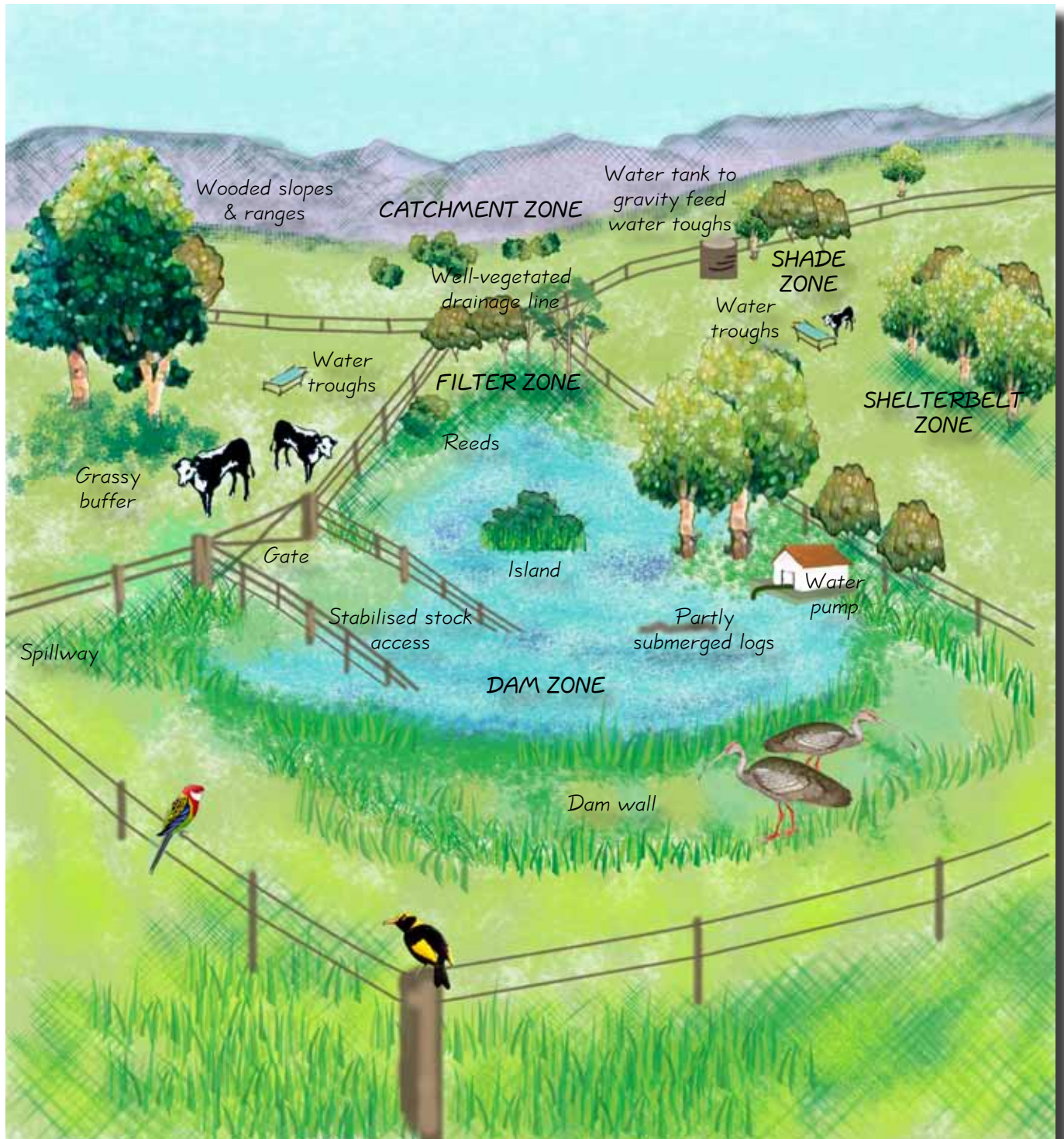
River Mat Rush (*Lomandra hystrix*)

Sally Wattle (*Acacia melanoxylon*)

Water Gum (*Tristainiopsis laurina*)

Weeping Bottlebrush (*Callistemon salignus*) (NB – for Bucca Bucca Creek Only)

*The farm dam and its immediate surrounds*



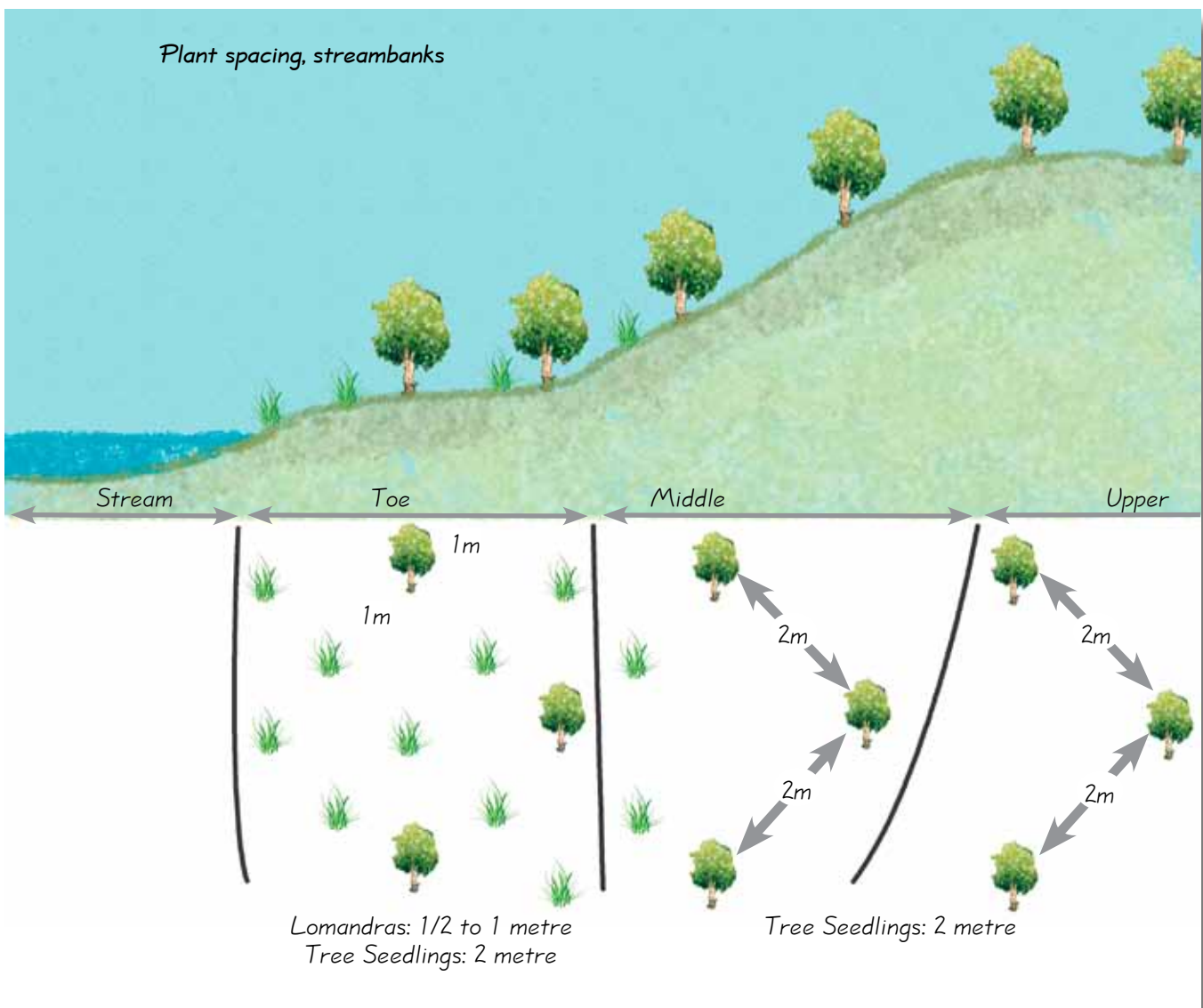


## PLANTING SITE PREPARATION & MAINTENANCE

While some weeds, such as Tobacco Bush, protect new plantings from excessive sun exposure and frost, it is essential to keep stock and smothering weeds away from new plantings. For example on:

- ▶ **Smaller Sites** – Weed Control can be carried out through the careful application of herbicides around the new plants, hand pulling, and regular mulching.
- ▶ **Larger Sites** – Weed Control around plantings can be carried out by spacing plants sufficiently to allow the use of your mower or slasher to maintain areas around the plants, and then Weed Control can be carried out in close proximity to the new plants through the careful application of herbicides, hand pulling, and regular mulching.

## PLANT SPACING





## CARING FOR YOUR NEW PLANTINGS

It is best to support tree species planted with Stakes, and to use Tree Guards where grazing by Wallabies is likely. It is also important to use Tree Guards when planting during and just before the cooler months of the year when frosts are likely.

An application of slow release, native fertilizer in early spring gives a worthwhile boost to plant growth.

## EXPANDING YOUR REVEGETATED AREA

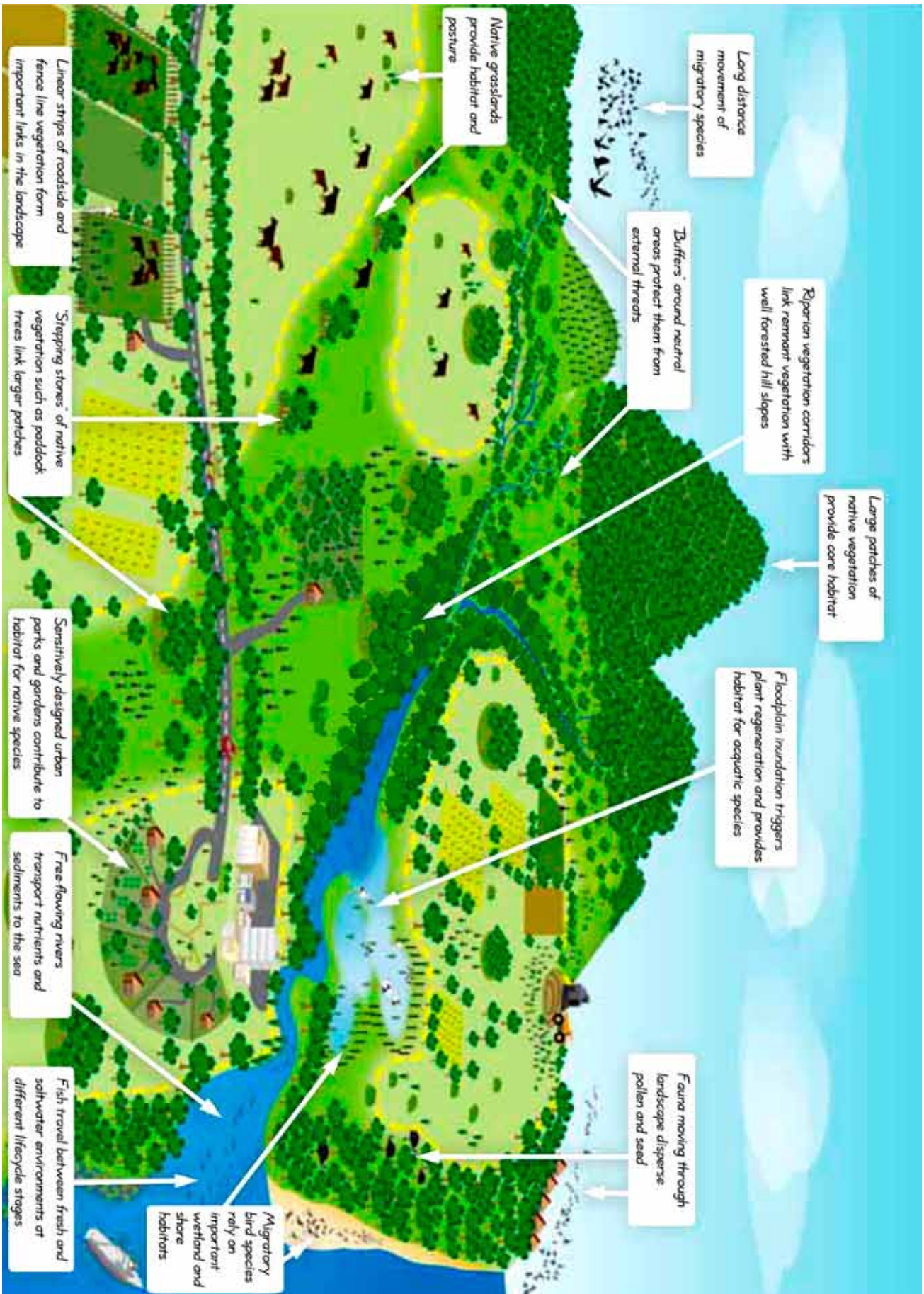
If you are considering planting a very large area, it may be possible to plant small groups of trees together and gradually plant outwards from these areas as the original planting establish.

## YOUR RIVER BANK VEGETATION IN THE LANDSCAPE

Improvements to riparian vegetation contribute to the conservation of biodiversity at the landscape scale. The regeneration of rainforest along the riparian zone leads to the formation of more resilient native vegetation corridors, providing:

- reduction in weed seed sources;
- increase in local native seed sources;
- routes for dispersal of native seeds;
- migratory routes for wildlife; and
- connections to forest reserves in National Parks and State Forests.

Role of Vegetation in the Landscape





## STOCK MANAGEMENT

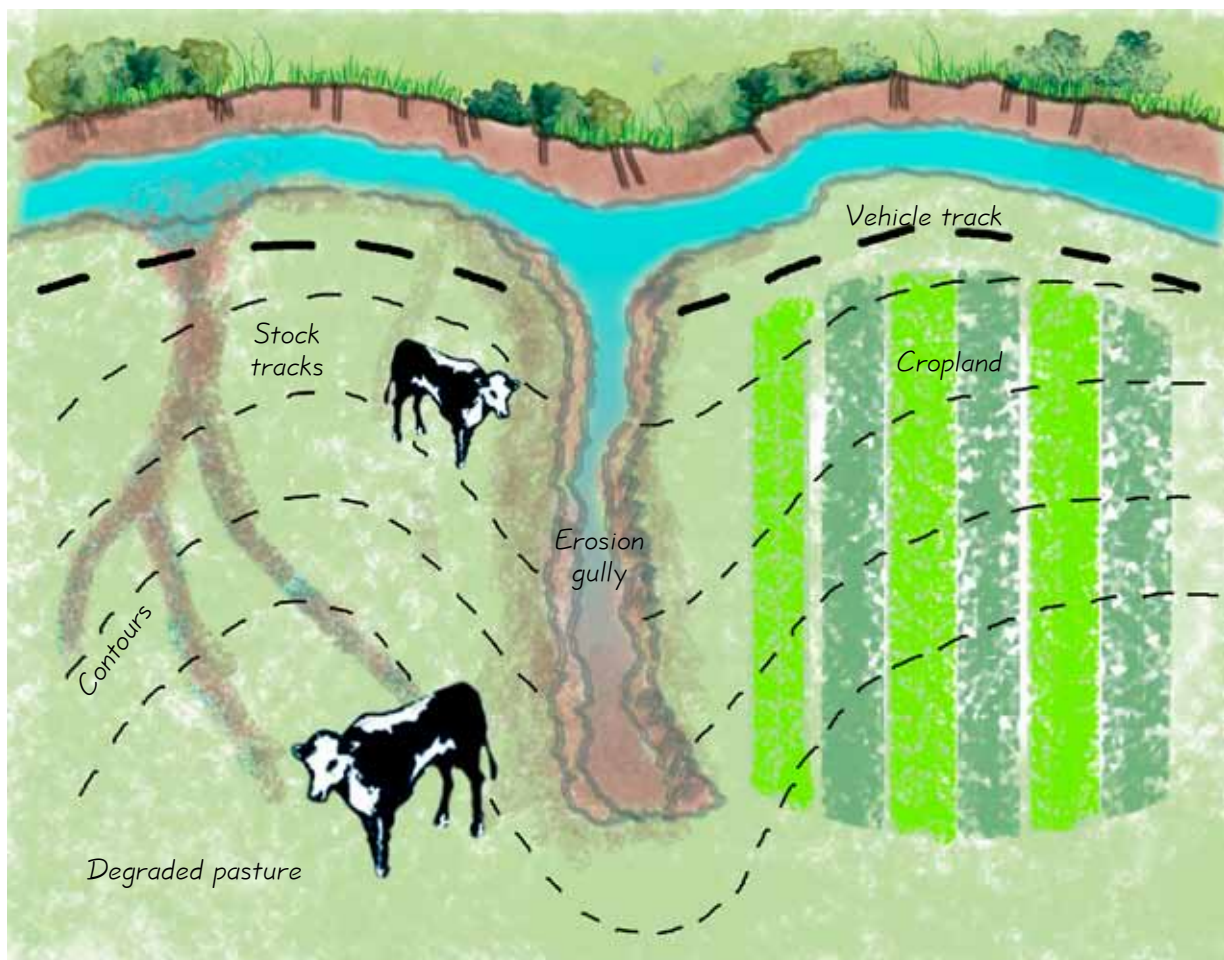
It is important to manage stock access to the riparian zone to reduce:

- ▶ damage to riparian vegetation from grazing;
- ▶ compaction of the soil by hard hooves,
- ▶ subsequent erosion and degradation of the river structure;
- ▶ pollution resulting from sediment washing into the water course from erosion sites;
- ▶ pollution resulting from cattle defecation; and
- ▶ stock exposure to water borne parasites, disease, and foot rot.

*Comparison of poorly managed and well managed stock access to riparian areas*

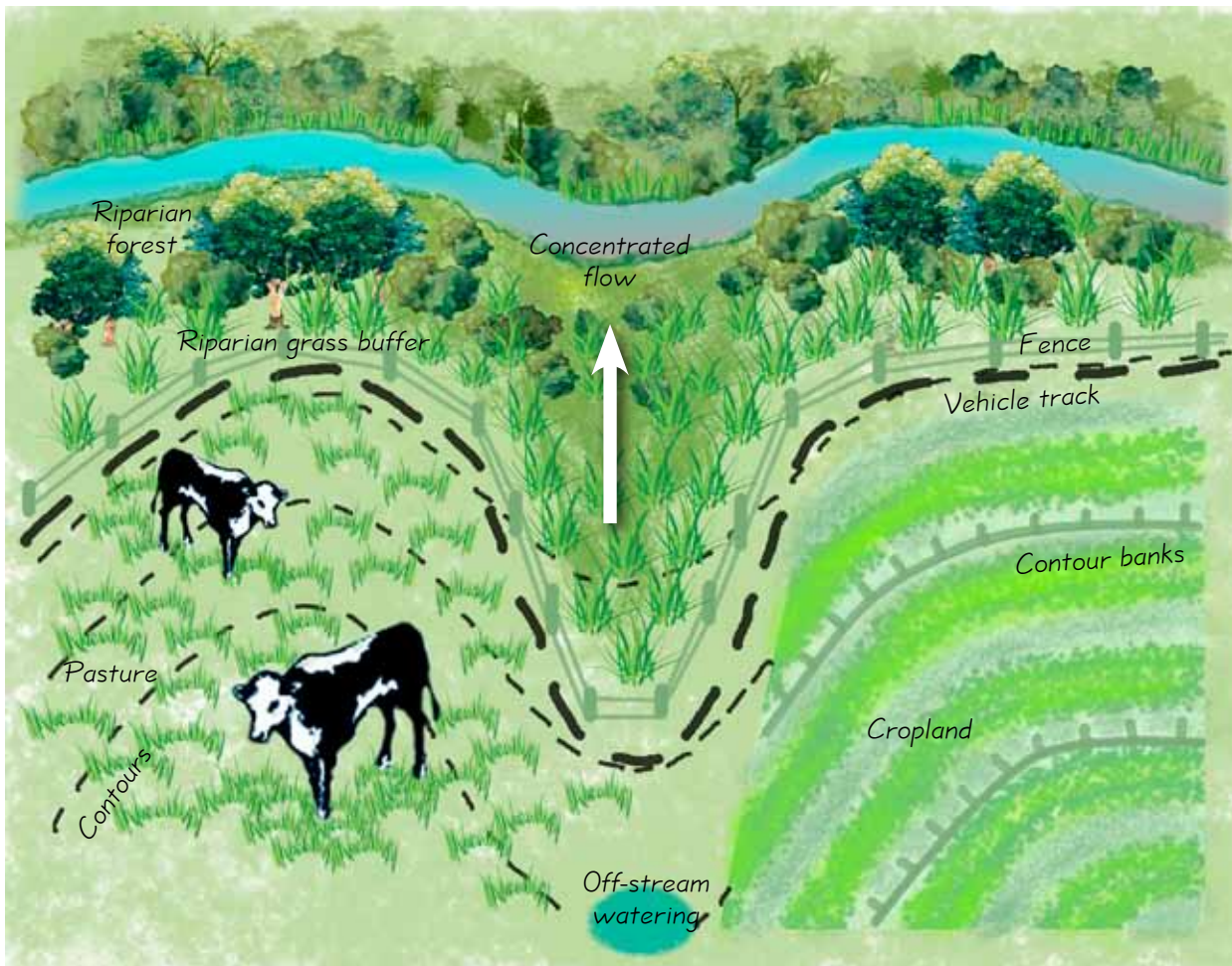
### *Poorly Managed*

*A degraded catchment and riparian land. Significant sediment and nutrient is derived from degraded pasture, poor crop management, unlimited stock access and gully erosion.*

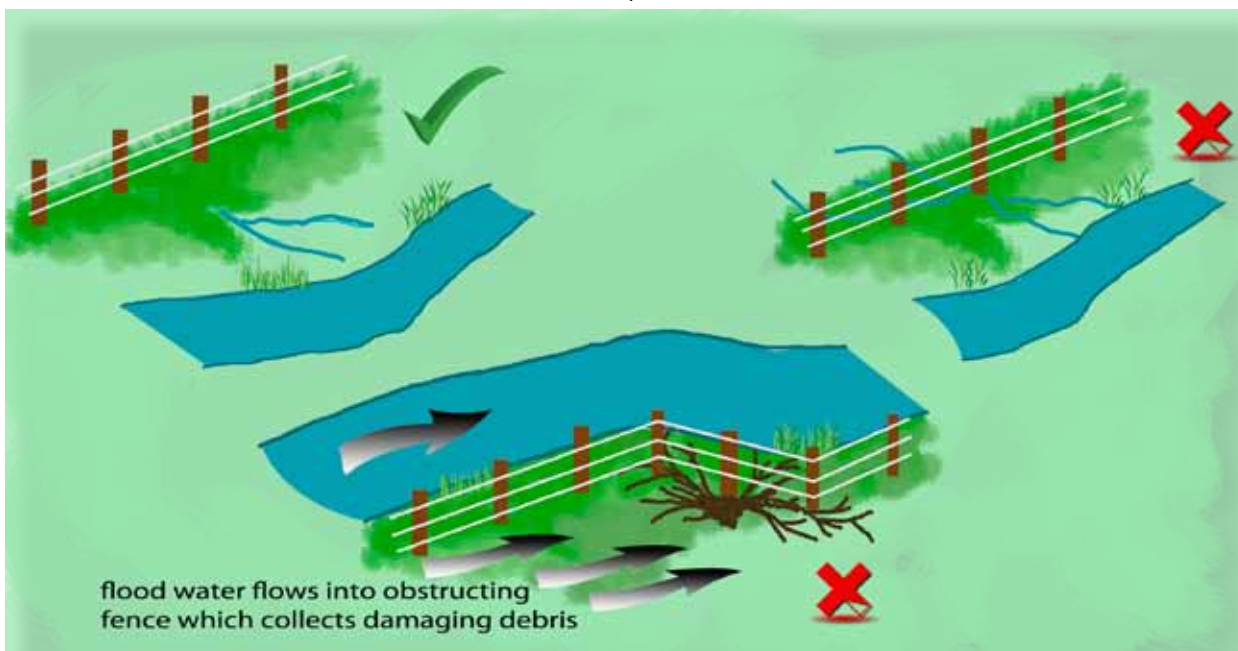


### Well Managed

A combination of good on-farm management and good riparian land. Riparian forest provides ecological benefits and absorbs nutrients, variable width grass buffers trap sediment and stock access is controlled.



Locate fences as far back from the watercourse as possible, and above flood level





## FENCING

### LOCATING FENCES

Fences too close to watercourses are liable to flood damage, so it is best to place fences at least 10-20 metres from the top of the bank. By doing so, you can also take out some of the bends and curves of the stream, reducing the number of end assemblies used. This can help to reduce the cost of the fence.

Fences are best installed parallel to river flow, so that they are less vulnerable to flood damage. If fences are required perpendicular to the flow then it is best to consider placing a temporary electric fence at these locations so that it can be easily retrieved before flood events and replaced once flood waters recede.

The wider the fenced riparian zone, the larger the area covered by vegetation which holds banks in place and increases the resilience of the system to withstand flooding and erosion. But remember to keep riverbank rehabilitation areas at a manageable scale, so that weed control can be realistically incorporated with stock management. Temporary grazing of riverbanks can be managed as a method of weed control.

### POST & WIRE FENCE

Conventional fences built from wooden posts, star pickets and wire are suitable for areas away from the flow of flood waters so that are not in a position where they catch debris. Fences which catch debris and with large posts that obstruct water flow are more likely to be washed away in floods.

It is important to attach wire on the downstream side of posts when fencing across flow paths. It is not recommended to use barbed wire as this is a particular trap for debris and wire washed away creates hazards downstream.



### PERMANENT ELECTRIC FENCE

Electric fences are much cheaper to construct initially and also much cheaper to repair following unexpected floods. A fence style which has proved to be particularly successful on the floodplain is constructed of star pickets and two live electric metal wires. The wires are ideally charged with a stand alone solar battery pack to reduce cost of electricity supply.



## PORTABLE ELECTRIC FENCE

In areas particularly prone to flooding, portable electric fences can also be quickly moved if there is advance notice of a likely flood peak, and then re installed after flood waters recede.



## STOCK WATERING

### WATER TROUGHS

Once a stream bank has been fenced, it will be necessary to provide paddock water troughs. The careful siting of troughs and supplementary feeding stations can also sometimes be used as an alternative to fencing to effectively encourage stock away from rivers and creeks.

Landholders have demonstrated that providing shade away from rivers and providing access to clean water in a trough high in paddocks; or providing a trough closer to preferred pastures, significantly reduces the amount of time stock spend on the riverbank without the need for fences. It also helps to place protein and mineral blocks away from rivers and creeks.

Ready access to clean, unpolluted water is an important factor in optimising animal health, growth rates and productivity. Hence, the costs of providing alternative water sources for stock, other than through unrestricted access to rivers or streams, may be more than repaid through increased production.



## DAMS

In some cases it may be practical to construct a small dam to provide off stream watering. When building a farm dam, it is important to make sure that the appropriate consent or licence has been obtained. Make sure that the dam is carefully located so that it is effective, safe and has minimal impacts on neighbours and the environment.

Unless a farm dam is part of your harvestable right you will need a licence or consent from the NSW Office of Water and Energy. To find your harvestable rights, see <http://www.farmdamscalculator.dnr.nsw.gov.au>.

The Office of Water has the discretion to approve dams in writing if they are constructed for a specific environmental management purpose, such as providing off stream stock watering.

Seek expert advice regarding farm dam design and location before commencing construction of any farm dam. Even if you do not require a licence for your farm dam, it is still your responsibility to minimise impacts on your neighbours and the environment. Discuss the matter with your neighbours before constructing a new dam.

Also ensure that during all stages of construction you provide adequate erosion control and minimise disturbance to waterways, areas of native vegetation, and sites of cultural significance.

Apart from determining whether your new farm dam needs a State government licence/approval, consent from local government is required for dams:

1. with a maximum surface area of more than 0.5 hectares located:
  - (i) in or within 40 metres of a natural waterbody, wetland or an environmentally sensitive area, or
  - (ii) in an area of high watertable, or acid sulfate, sodic or saline soils
2. with a surface area of water of more than 20 hectares or a maximum total water volume of more than 800 megalitres.
3. Local Planning Regulations
4. Designated Floodplains

If you are considering construction on a designated floodplain you will need to seek consent from the NSW Office of Water regarding flood flow diversion impacts.

### 5. Fish Passage

Under the Fisheries Management Act 1994, any new dam or modification to an existing dam may require the owner to provide for fish passage. Contact your local NSW Fisheries office for further advice.

Dams can be used to gravity feed water troughs, or can be constructed with a formed access point to allow planting around the dam for improved water quality.



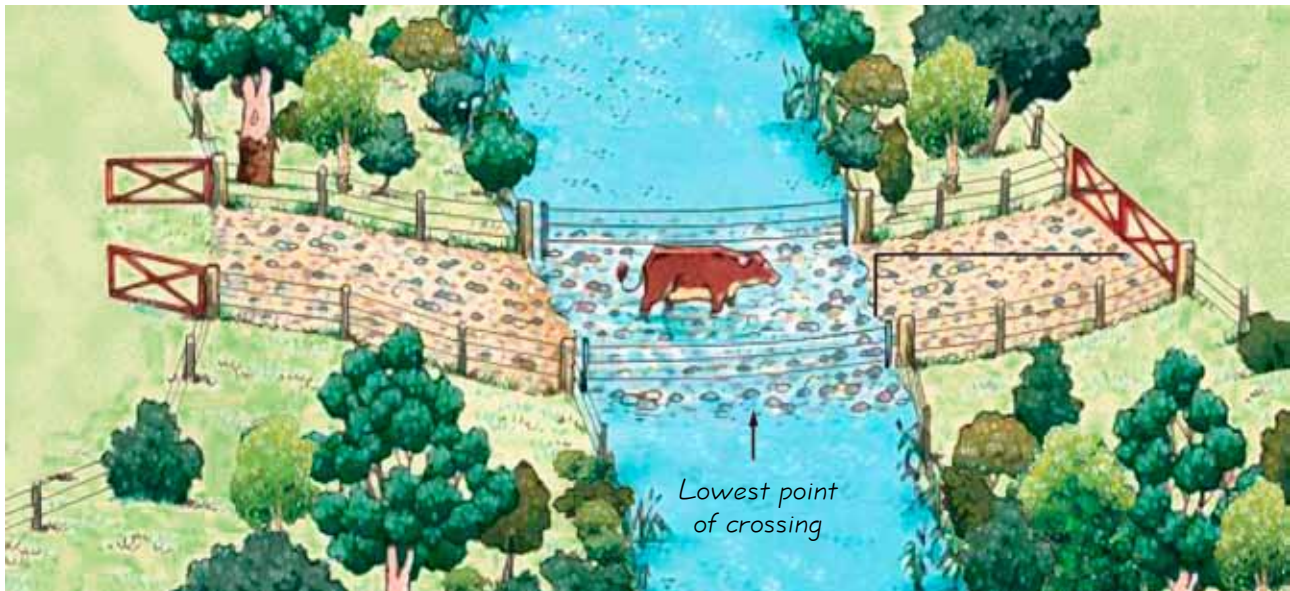
## FORMED ACCESS POINTS

A less desirable alternative to fencing and water troughs is a formed access point for stock to water from the river at a carefully selected section of the bank. It is important to avoid boggy areas, and the outsides of river bends where flow speed is high and banks are subject to increased erosive forces.

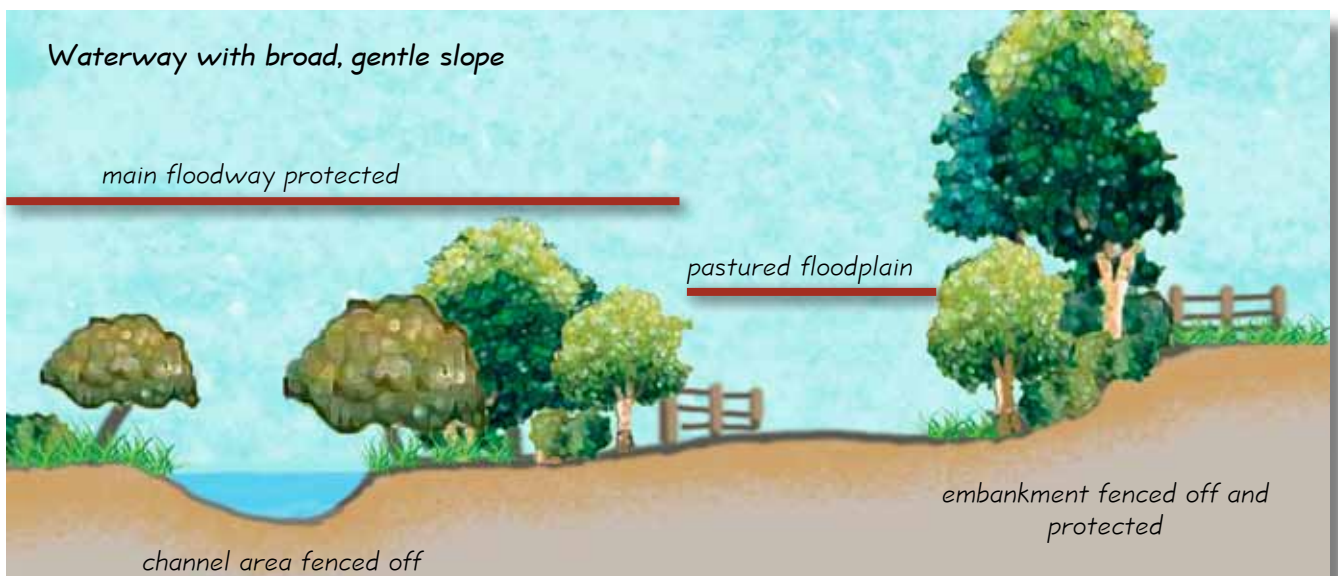
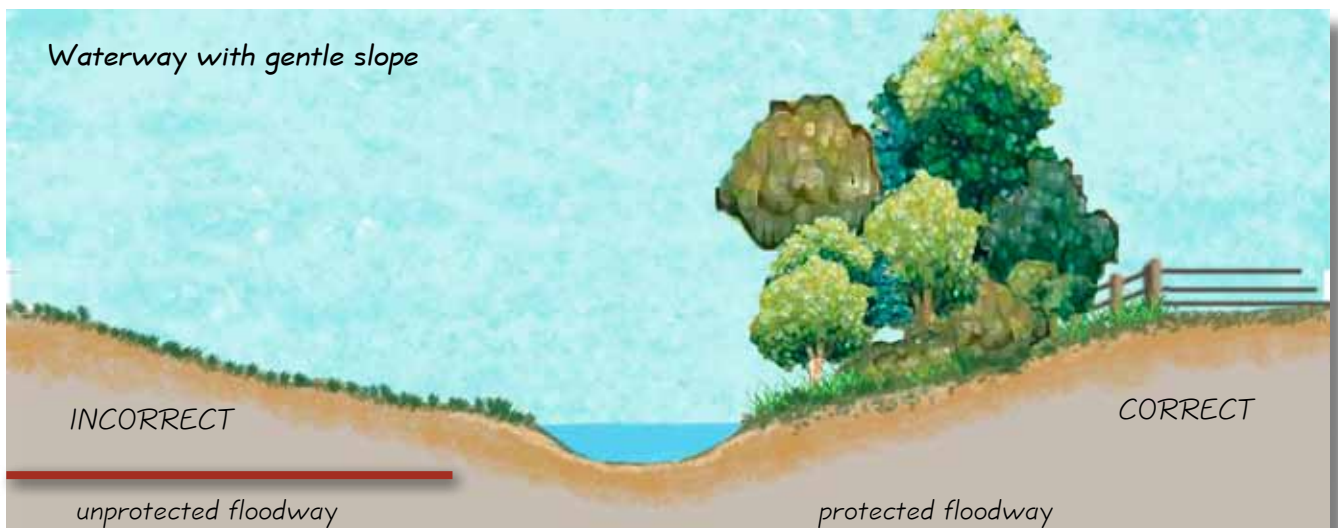
Cross-stream fencing may be required to prevent animals wandering along the bank. A graded slope into the river is selected or constructed as the site for a formed access point. Its surface is then protected by using concrete, compacted gravel, logs or similar materials to form a walkway.

It is important to consider likely changes in the depth of flow in order to make sure that access to water is available for as much of the year as possible. When dealing with steep, difficult riverbanks, it is important to recognise that stock show marked preference for using a more-comfortable access point to drink, so a site with a gently sloping bank is preferable.

*An example of how a stock crossing can be constructed to minimise damage to the waterway.*

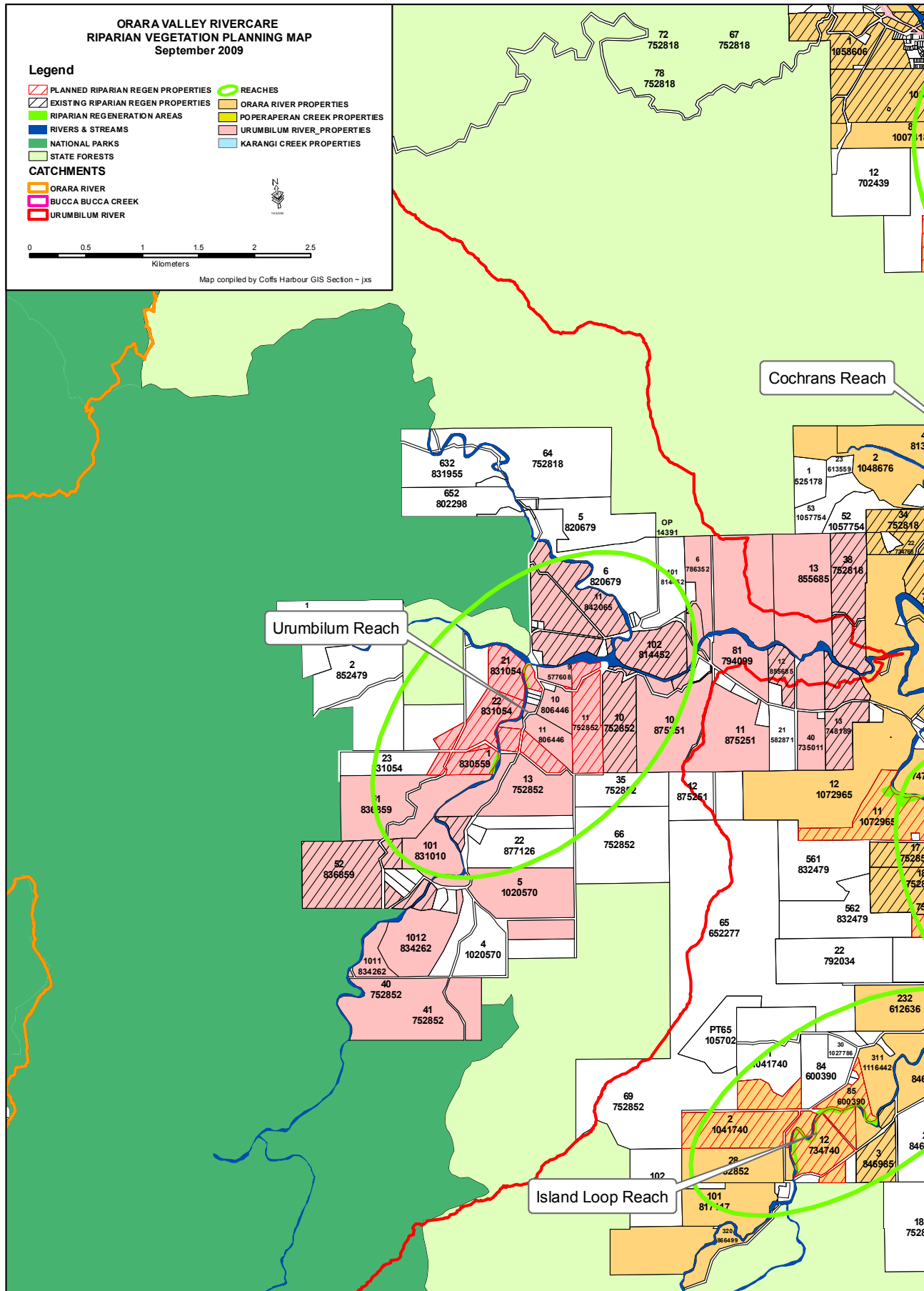






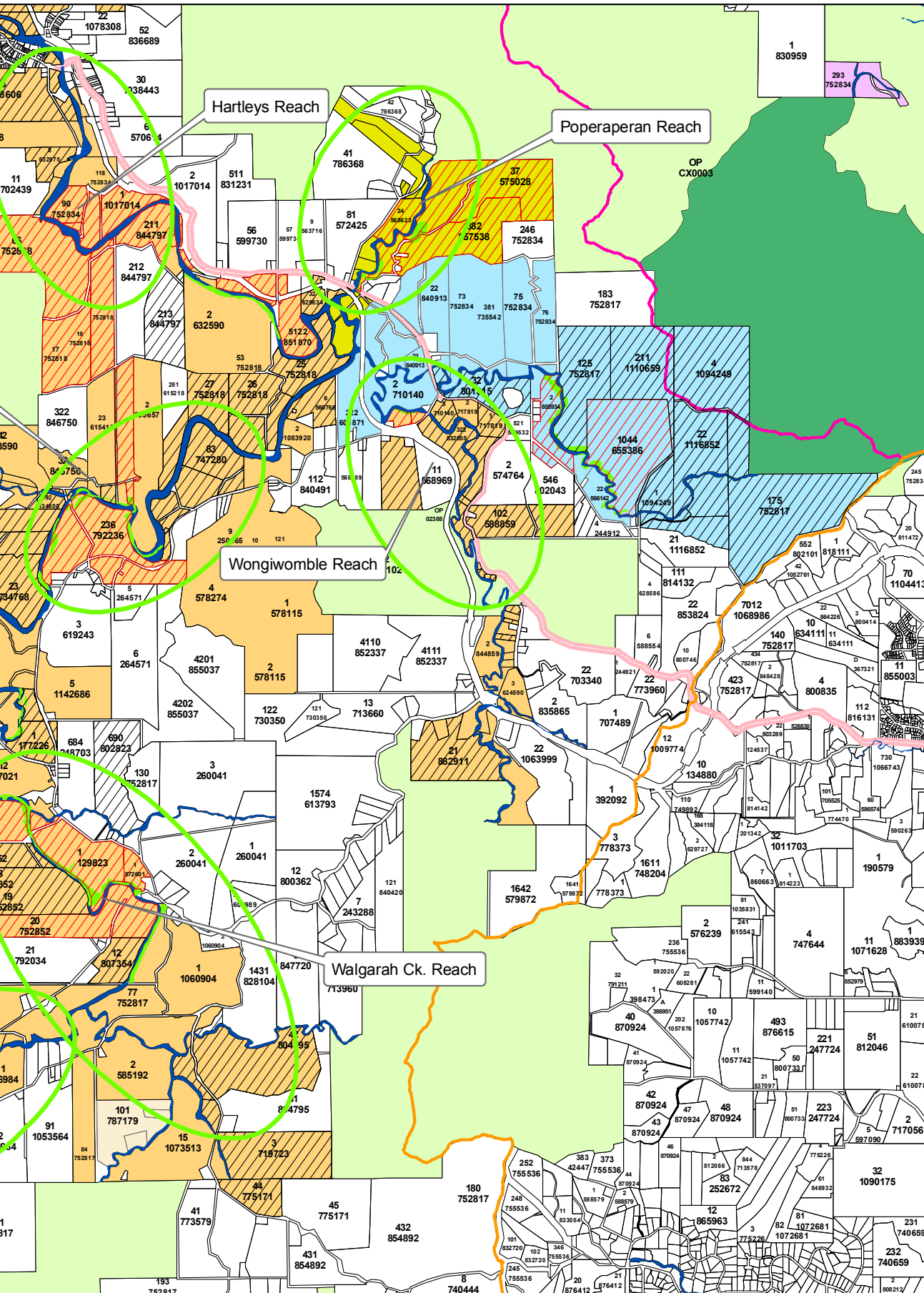
## Southern Orara Valley

The following maps show how riparian zones within the Orara Valley connect to well forested hill

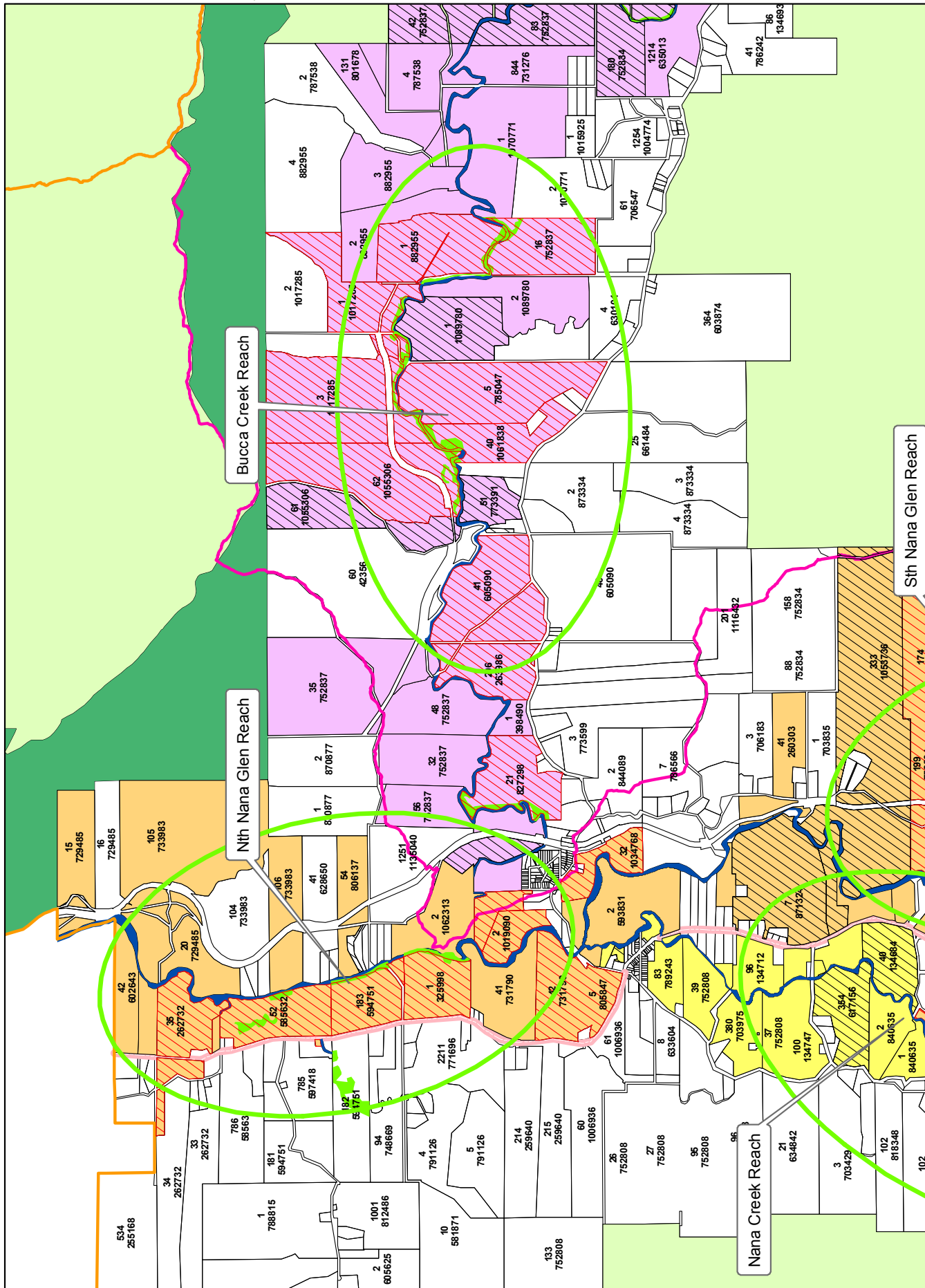




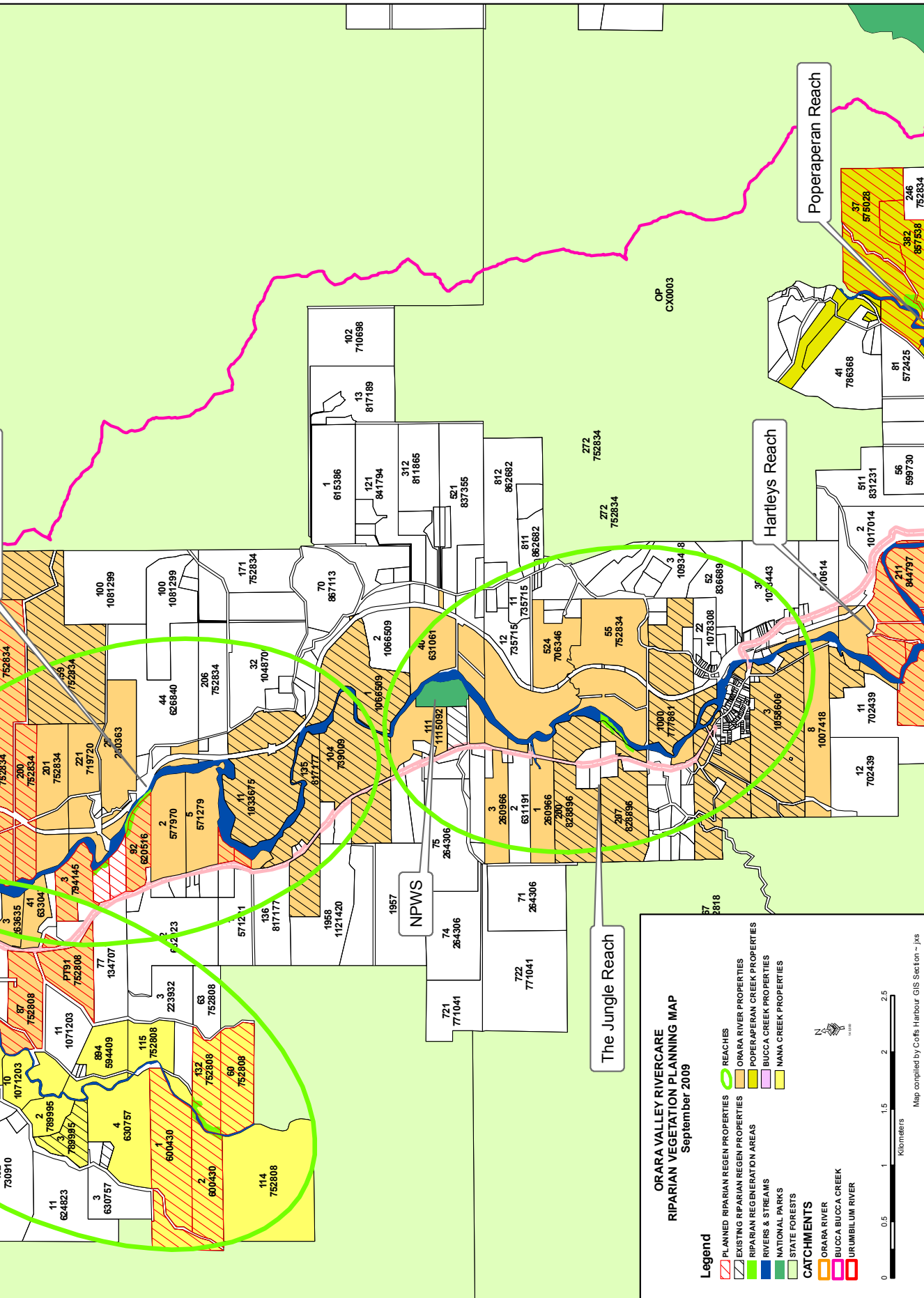
slopes and reserves. See where your property fits into the bigger picture on the following maps.



## Northern Orara Valley







## WHERE TO GET ASSISTANCE

### LOCAL LANDCARE GROUPS

- |   |                |              |
|---|----------------|--------------|
| ▶ Cochrans Pool Urumbilum RiverCare Group | Doug Hoschke   | ph 6653 8372 |
| ▶ Karangi LandCare Group                  | Ron Smith      | ph 6653 8249 |
| ▶ Nana Glen LandCare Group                | Peter Franklin | ph 6654 3452 |

### ORARA RIVER REHABILITATION PROJECT

- ▶ Orara River Rehabilitation Project Officer, ph 6648 4000

### REGIONAL LANDCARE

- ▶ Coffs Harbour Regional LandCare, ph 6651 1308

### NORTHERN RIVERS CATCHMENT MANAGEMENT AUTHORITY

- ▶ Coffs Harbour, ph 6653 0150
- ▶ Grafton, ph 6642 0622

### NSW OFFICE OF WATER (RE FARM DAMS & RIPARIAN ZONE WORK PERMITS)

- ▶ Grafton, ph 6641 6500

### NSW DEPARTMENT OF PRIMARY INDUSTRIES

- ▶ Coffs Harbour ph 6650 3111
- ▶ Grafton ph 6640 1600

### LIVESTOCK HEALTH & PEST AUTHORITY

- ▶ Grafton, ph 6642 3699





*Junction of the Orara and Urumbilum  
Rivers in the 1990's*

# ORARA RIVER REHABILITATION PROJECT LANDHOLDER BOOKLET



*Cats Claw Creeper covering native trees*



*Native Bangalow regenerating*

## ORARA VALLEY RIVERCARE GROUPS MANAGEMENT COMMITTEE INC

