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HEALTHY ENVIRONMENT

LANDHOLDER SERIES

PROPERTY PLANNING GUIDE

ACKNOWLEDGEMENTS

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DISCLAIMER

Information sources have been provided in this document as appropriate and full references may be found in NRM South's 'Healthy Farming & Environment Reference Guide'. While information is considered true and correct at the time of publication it should be acknowledged that changes post publication may affect the accuracy of content.

This guide is designed as an aid to property planning, users of this guide must consider their own personal circumstances and seek further advice as appropriate.

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Tasmanian devils
Photo: P. Tonelli

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NATIVE VEGETATION

BENEFITS OF NATIVE VEGETATION ON YOUR PROPERTY

Biodiversity

- Habitat for birds, mammals and insects
- Conservation and protection of threatened species
- Connectivity between natural areas benefiting flora and fauna on a landscape scale -connectivity also helps maintain diversity
- Legacy for future generations
- Recreation

Productivity

INCREASED LIVESTOCK AND CROP PRODUCTION

- Providing shade
- Protection against winds
- Reduced moisture loss (adjacent pasture/crops): reduced windspeed and higher humidity within sheltered areas

LIVESTOCK PRODUCTION

- Lower birth mortality in both cattle and sheep
- Increased twin lamb survival
- Increased livestock growth rates through reduced heat and cold stress resulting in improved meat and/or wool production
- Increased gross value of pasture output (at its highest when proportion of remnants is 34%); retain paddock trees and patches of bush for sheltered microclimates

CROPS AND FRUIT

- Warmer soils in spring and earlier crop planting
- Less blossom damage prior to fruit set: frosts and strong winds will damage blossoms, reducing pollination and production of fruit
- Reduction in moisture loss gives better crop production
- Increased yields of 20%-100% were observed in sheltered horticultural crops compared with unsheltered crops
- Pollination of crops is improved when native insects can fly from adjacent bushland
- Habitat for biological agents: predatory species that control pests

Eastern barred Bandicoot
Photo: B. Brown

Tasmanian Devil
Photo: S. Bryant.

did you know?

Native fauna can consume large numbers of crop and pasture pests.

Magpies will consume 40 scarab (grass-grub) larvae a day.

Insectivorous bats can consume up to half their body weight in invertebrates in a night and some species feed extensively on agricultural pests.

Chiloglottis sp.
Photo: NRM South

A dry forest in SE Tasmania
Photo: NRM South

Soil and water conservation

- Erosion control, sediment retention: vegetation slows water and wind movement
- Stabilises soil surface through the action of roots, organic matter and increased infiltration
- Lowers water table through root action reducing waterlogging and salinity
- Filters pollutants from surface water flows: ground cover plants and litter layer help filter out pollutants before they reach the waterways

Aesthetics & well-being

- Connection to place
- Recreation (bird-watching, bush walking)
- Landscape values
- Satisfaction in preserving original landscape
- Additional income
- "spiritual, therapeutic effect"

Pterostylis pedunculata
Photo: NRM South

Types of native vegetation

Vegetation type is largely dependent on a multitude of factors, including soil type, geology, altitude and rainfall.

- Riparian (around watercourses)
- Wetland
- Saltmarsh
- Treeless (native grasslands, scrubland, heathland & moorland)
- Eucalypt forest and woodland
- Non-eucalypt forest and woodland
- Rainforest
- Regrowth vegetation

Management

- Wet forest: livestock exclusion preferable
- Dry forest and woodlands: can be grazed for short periods during winter
- Riparian and wetland areas: total livestock exclusion
- Encourage presence of all sstructural layers within vegetation (ground cover, shrub layer, canopy including regenerating young trees, standing dead/dying trees and fallen logs)
- Provide linkages between remnants and large bush areas where possible
- Weed control: Larger remnants are more resilient (likely to resist weed infestation and dieback)

shelterbelts

Where there is a lack of natural native vegetation, shelterbelts can be grown to provide some of the benefits, including connecting to larger native vegetation stands.

Use local native species, replicating the structural layers found in natural vegetation (planting trees first then underplanting with appropriate shrubs, sedges, grasses and ground cover species).

OTHER CONSIDERATIONS

Refuge for browsing animals (wallabies and pademelons)

Invest in wallaby-proof fencing around your production areas – leave bush areas fence-free to allow natural animal movement. Plan wallaby-proof fencing with neighbouring land owners.

If browsing animal populations are high, seek advice from Wildlife Management Branch for Game Management Plans. Reducing populations of browsers is preferable to allowing them to starve if cut-off from a food source. High populations fenced off from a food source will also impact heavily on the understorey within native vegetation.

Native predators

Tasmanian Devils and Spotted tailed Quolls (both threatened species) will predate on domestic poultry if the opportunity arises. It is your responsibility as a landholder to ensure your poultry are housed safely. See Parks and Wildlife Service design for a safe free-range quoll-proof chook house.

Wedge-tailed Eagles, White-bellied Sea-Eagles and Grey Goshawks: There are some public misconceptions about raptors that put these birds at risk. Wedge-tailed eagles, sea-eagles and grey goshawks are listed as endangered. Landholders should provide shelter such as bushes or other places for free-range poultry to take refuge if raptors are around. Young chicks/bantams should be fully protected.

Healthy lambs and kids are rarely taken by eagles and moving livestock closer to habitation when due to lamb/kid reduces the risks even further. Occasionally young inexperienced eagles can become a short term problem. Seek advice and assistance from Biodiversity Conservation Branch of the Department of Primary Industries, Parks, Water and Environment.

White phase of Grey Goshawk

Photo: Cradle Coast NRM

LAND CLEARING

In Tasmania, land clearing controls apply to both public and private land. Controls apply to both forest vegetation and threatened non-forest vegetation communities. A certified forest practices plan is required to authorise land clearing (clearing forest or clearing and converting threatened non-forest native vegetation).

There are some exemptions from the requirement to have a forest practices plan to authorise land clearing such as:

- Providing a buffer for existing infrastructure (e.g. dwellings, fences) or for public safety
- Clearing associated with dam works or easements (in accordance with relevant permits)
- Approved fire management programs
- An area less than 1 hectare per year or less than 100 tonnes of wood (whichever is lesser) and is not classed as vulnerable land (e.g. streamside, steep slope, high erodibility, karst).

There may also be value in the future for retained native vegetation through carbon credits.

FIRE

To minimise the risks associated with fire, there are four main areas that Guidelines for *Development in Bushfire Prone Areas of Tasmania* recommends should be considered:

A. DEFENDABLE SPACE FROM BUSHFIRES:

Produced by separation of the building from the bushfire hazard and minimisation of nearby hazards;

B. ROADS:

Planning for network connectivity and designing and constructing roads and fire trails for emergency use;

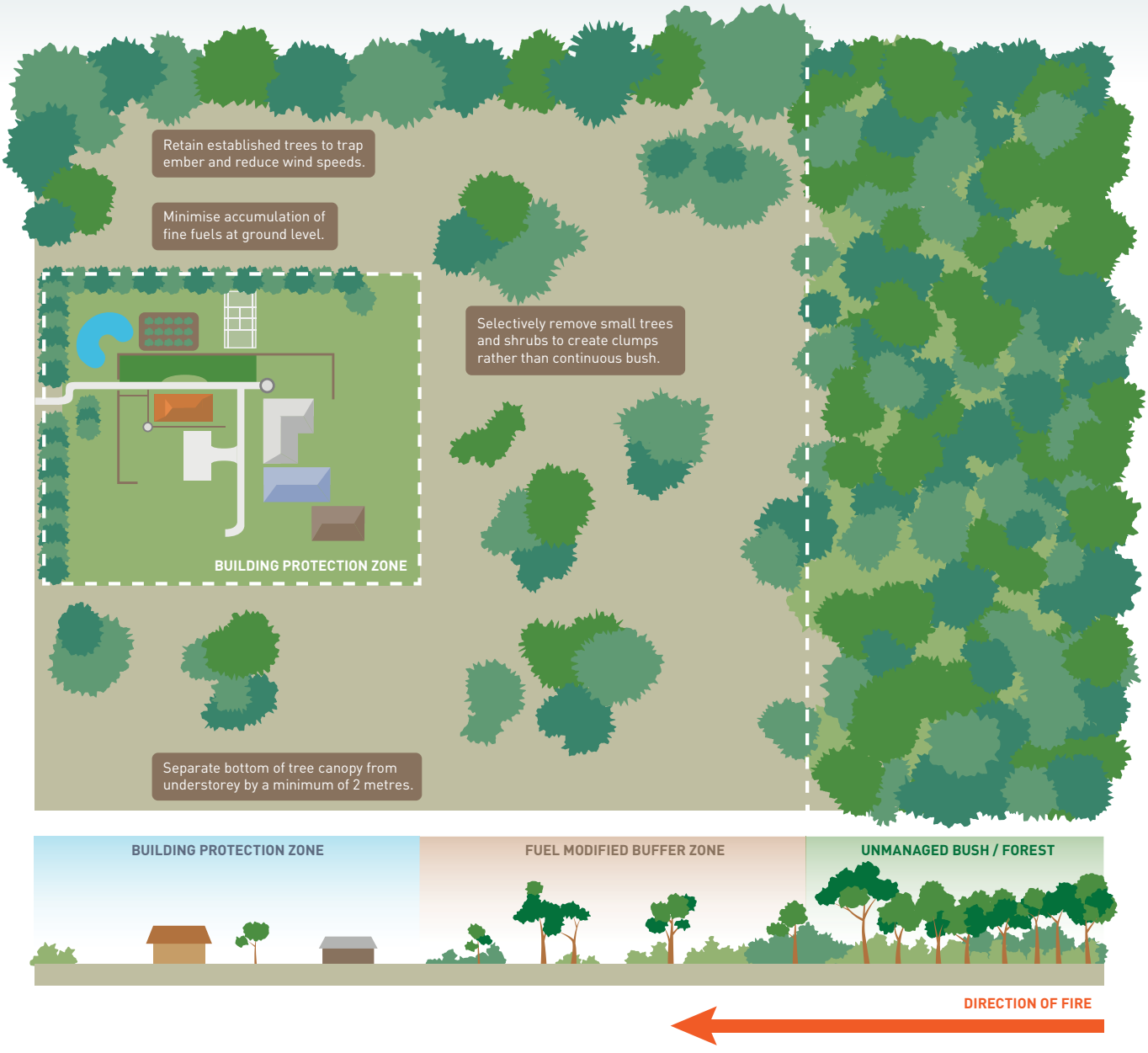
C. WATER SUPPLIES:

Provision of adequate and accessible water supplies for effective fire fighting; and

D. BUILDING:

Siting, design and construction to maximise fire safety.

Lot layout showing the Building Protection Zone surrounded by the Fuel Modified Buffer Zone from "Guidelines for development in bushfire prone areas of Tasmania" Courtesy of the Tasmanian Fire Service



BUSH BIRDS MAKING YOUR PLACE THEIR PLACE TOO

This section explains which bush birds may be present or absent from your place and what you can do to encourage a greater diversity to live with you.

The drier, settled areas of southern Tasmania, compared to other places, still have much of their original bush. In many instances the clearing for agriculture and urban development has produced a mosaic of habitats including highly modified treeless paddocks through to fully vegetated hills, in which many species of birds still thrive. But bird species begin to decline or will be absent where intact patches of bush are lost or if this mosaic becomes too highly modified.

About 60 species of birds live within the bush of southern Tasmania. Common groups of species include honeyeaters, parrots, robins, pardalotes and whistlers. Some, like Pink Robin and Scrubtit, prefer wet forest and others, such as Forty-spotted Pardalote are rarely seen outside their preferred specialist habitat.

Some species live in the same bush all year, whilst others migrate in the late autumn to increase their foraging range, descend in altitude or cross Bass Strait to spend their winter on mainland Australia. Bush habitat also supports birds of prey, water birds in creeks and wetlands, and a small number of other species using heaths or grasslands on the forest fringe.

Visit a local patch of intact bush and discover the multitude of bird species that could live with you.

The Yellow-throated Honeyeater needs bush with good structure, as it forages high in trees but nests in shrubs close to the ground.

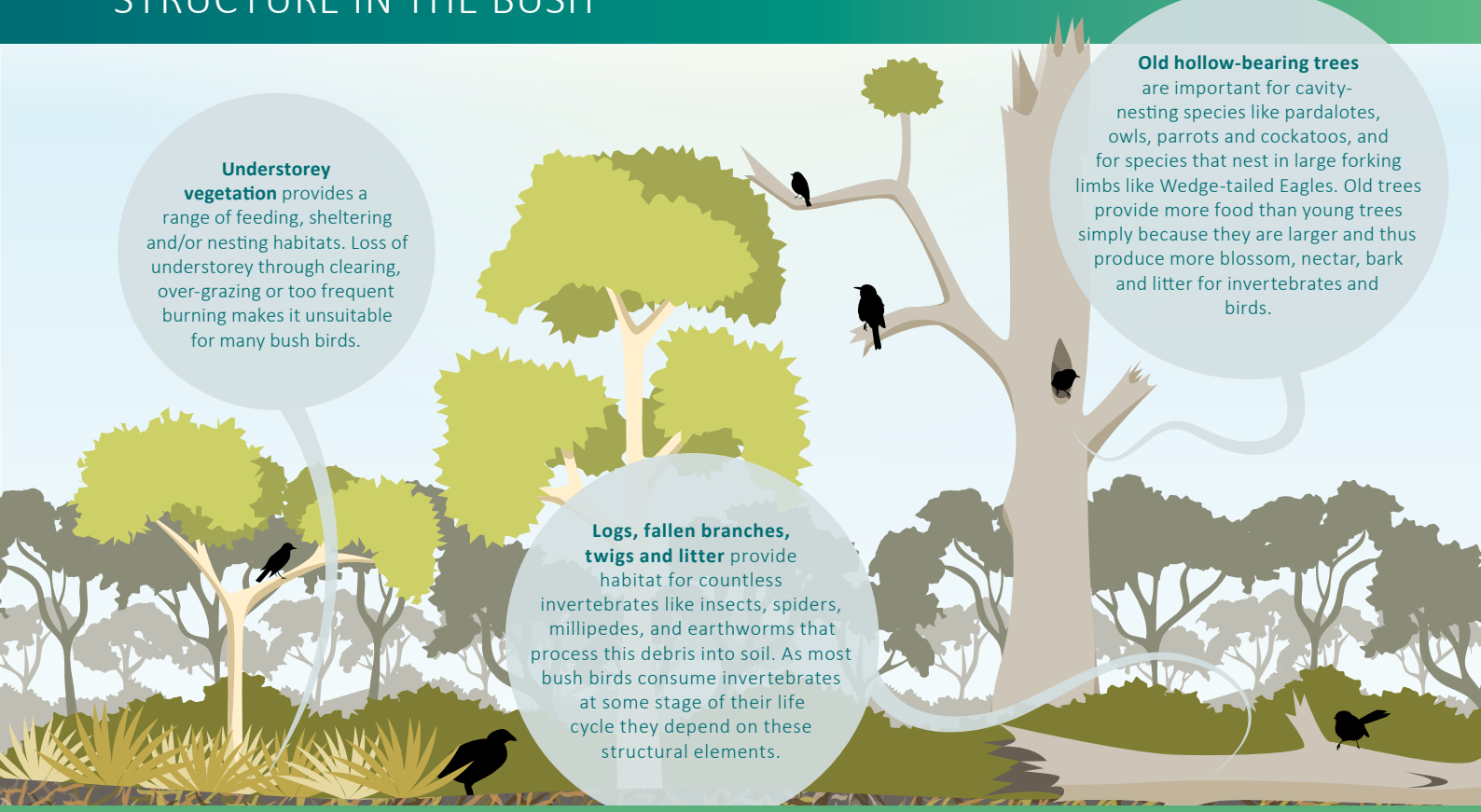
BUSH BIRDS' HOMES

Just like us, birds have three basic needs:

1. Their preferred food.
2. Places to rest and hide from danger and inclement weather.
3. A safe place to raise young.

And just like us, different species of bird have their preferences in where they find these basic needs.

STRUCTURE IN THE BUSH



Messy is good!

Intact bush usually has a full range of structures – a varied understorey of grasses and herbaceous plants, small and tall shrubs and different aged trees especially large old eucalypts with hollows.

PATTERNS OF BIRDS IN THE LANDSCAPE

Large areas of bush with little human disturbance have the most bird species as they contain all structures that birds need: older trees with cavities, mature trees with full leaf canopies, younger trees, tall and short shrubs, tall grasses and saggs interspersed with herbs. In wetter areas the ground layers are often richer in ferns, cutting grass, and mosses.

Areas close to waterways are excellent sites for revegetation. Often some of the structural layers already exist because they are less suited to agriculture and primary productivity is naturally high. Planting a mix of trees and shrubs around marshes can be very effective.

Protecting existing remnants with new plantings should take into account how birds use habitat patches and stepping stones. Always seek to bring the size of patches over 20 – 30 ha, as this may provide persistent breeding habitat.

Photo: Chris Tzaros

Even **single paddock trees or small copses** are important to retain as stepping stones where their context is good. They provide shelter and nesting for cockatoos, owls and other animals.

Rehabilitating understorey and helping regeneration in large (>20-30ha) patches should increase bird diversity. Techniques can be as simple as removing or reducing grazing and browsing pressure, or using fire or disturbance to encourage seedlings.

Open paddocks remote from intact bush are often not worth replanting to increase bird diversity. This is because all the structural layers that birds need can take at least a whole human generation to grow.

IMPROVING HABITAT FOR BUSH BIRDS

Retain and restore existing bush, then buffer and reconnect - this is the priority order of work to help bush birds survive, thrive and recolonise.

1. As the highest priority, retain extensive areas of bush with structurally diverse vegetation, good understorey and especially bush that is close to waterways.
2. Where extensive areas are structurally degraded, restore missing structural elements by excluding or reducing grazing and browsing, active regeneration or even selective replanting.
3. Retain habitat patches larger than 20-30ha and restore missing structural elements.
4. Retain smaller patches, copses and even single paddock trees, where they can act as 'stepping stones' between habitat patches and restore missing structural elements.
5. Increasing the size of bush remnants by buffering them with new plantings may also help to increase bird diversity, but only if the remnants are structurally diverse.
6. Weeds — especially gorse and blackberry — may be extremely important in retaining bird diversity in areas where native understorey has been lost. A cautious and staged approach to their control is necessary if it is the only remaining habitat.

PATTERNS OF BIRDS IN THE LANDSCAPE

Photo: Chris Tzaros

Woodlands and forests with intact layers of vegetation support the richest array of bush bird species including pardalotes, robins, whistlers, honeyeaters, thornbills and cuckoos. The mix of species will vary depending on the vegetation (e.g. Golden Whistler and Dusky Robin prefer drier areas whereas Olive Whistler and Pink Robin prefer wet areas).

Paddocks with some trees may provide feeding and nesting sites for species such as Forest Raven, Magpie, Eastern Rosella, Noisy Miner and Kookaburra. Raptors like Brown Falcon survey the landscape for prey atop paddock trees while other species use trees and small copses as 'stepping stones' between favoured habitats.

Bush edges are favoured by Scarlet Robins, Brown Thornbill and Superb Fairy-wren: species that may feed in the open but like bush nearby where they can roost and escape from danger.

Home gardens in any area can be rich in birds, especially if it is close to native vegetation, but are typically dominated by the introduced Sparrow, Starling and Blackbird. Flowering plants provide food for New Holland Honeyeater and wattlebirds that may defend rich nectar sources and exclude smaller species. Plant dense bushy vegetation to support more bird species like Superb Fairy-wren and Eastern Spinebill.

Open paddocks typically favour introduced species like Skylark, Goldfinch and Starling but native birds like Sulphur-crested Cockatoo, Magpie, Masked Lapwing, Pipit and Flame Robin use them on a frequent basis. Swamp Harrier nest in open paddocks if long grass provides shelter.

STRUCTURE IN THE LANDSCAPE

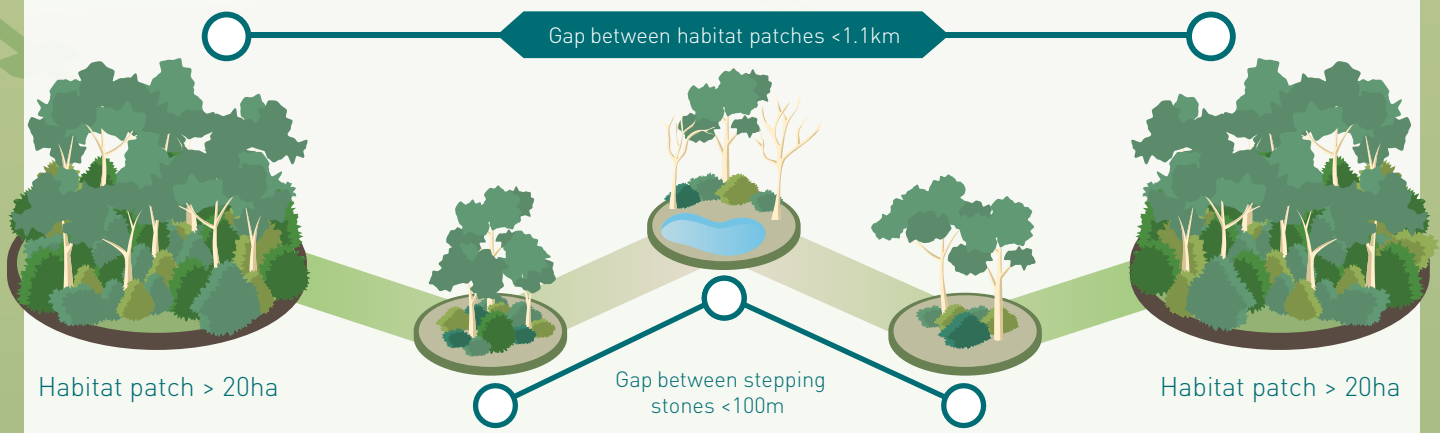
Most bush birds are reluctant to fly over open areas greater than 100m and prefer to use 'stepping stones' to move between habitat patches.

Habitat patches

In Tasmania, good habitat patches are considered larger than 20-30ha, with a range of structures, enabling many bird species to breed successfully.

Stepping stones

Stepping stones are patches smaller than this: even as small as single paddock trees. Many birds may use these stepping stones to travel between habitats, but seldom live or breed in them.



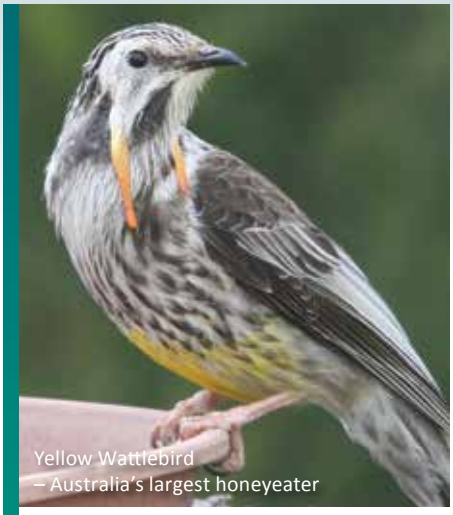

Scarlet Robin – male

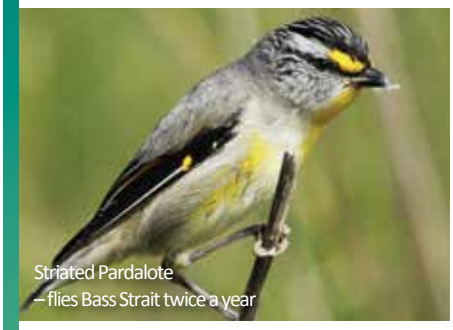

New Holland Honeyeater

GETTING TO KNOW YOUR BIRDS

Discover the birds in your area by looking and listening. Binoculars will help you see the detail needed for positive identification.

Birds have distinctive calls and with practice you will learn what they are saying and why. Bird books (e.g. Field Guide to Tasmanian Birds by Dave Watts) and phone apps (e.g. Bird in Hand by the Tasmanian Parks and Wildlife Service) will help you identify local species.


Yellow Wattlebird
– Australia's largest honeyeater


Striated Pardalote
– flies Bass Strait twice a year


Brown Thornbill
– the classic 'little brown bush bird'


Noisy Miner – an aggressive bird that thrives in modified environments


Crescent Honeyeater – male

NOISY MINERS, PATCH SIZE, UNDERSTOREY AND ISOLATION

One reason for species loss may be an influx of aggressive bird species like the Noisy Miner which thrive in modified environments. This medium-sized native honeyeater forms social colonies and in small (less than 20-30 ha) remnants will mob and drive out other usually smaller bush birds.

Other dominating species like the butcherbird, Magpie, currawong and raven, can co-exist with the Noisy Miner but the overall net effect is species loss.

Loss of the understory or tree layer can also make a site unsuitable for some bird species: shrubs are a rich food source of insects and nectar, and trees provide lerp, manna and a host of invertebrates on their trunks, branches and foliage.

Some bird species will not fly more than 100 metres across open ground without some cover in which to hide. Most won't fly more than a kilometre.

Either separately or in combination, loss of understorey, small patch size and increasing isolation account for much of the decline in bird species compared to those in structurally intact bush.

RESTORING EXISTING BUSH

Improve species and structural diversity of existing bush remnants by:

- never clearing understorey
- reducing grazing/browsing impacts
- burning or disturbing soil to help seed germination and survival
- planting missing grasses, shrubs or trees
- removing weeds

Restoration is used to increase the 'health' of bush, habitat patches and stepping stones.

Priority for restoration depends on the health of each patch. If all the layers (structural elements) are already there, restoration isn't needed. See which elements are missing and work out the best way to restore them. Some bush is naturally deficient in some structural layers, so if in doubt, have an experienced botanist look at your bush before commencing work.

PLANTING

Planting means direct seeding, planting or transplanting native species in cleared (non-native) areas or home gardens. Planting is mainly used to protect and connect existing patches, but can also provide new habitat in gardens.

THREATENED SPECIES - MANAGEMENT

Certain plants and animals are naturally rare because they exist within a small range and/or in small populations and as a result are vulnerable to changes that alter their habitat or wipe out whole populations. Other more common species may become threatened with extinction due to current processes or actions that, if left unmanaged, threaten their existence over time.

In either case, future survival requires conservation management and both federal and state governments have legislation for categorising and protecting endangered species.

Threatened species are given a listing category depending on the extinction risks the species face. The listing criteria are slightly different between Commonwealth and Tasmanian listings and species can be listed differently under the State and Commonwealth Acts (Table 1).

TABLE 1: STATE AND FEDERAL LEGISLATION CATEGORIES FOR THREATENED SPECIES

TASMANIAN ACT: *THREATENED SPECIES PROTECTION ACT 1995*	COMMONWEALTH ACT: *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999* (EPBC ACT)
TASMANIAN	**COMMONWEALTH**
Extinct (X): Those species presumed extinct.	**Extinct (EX):** Where a species has not definitely been located in the wild for the past 50 years. A well known Tasmanian example is the thylacine. The last recorded, proven sighting was in 1936. Since then we have had many reported sightings, often dozens a year. However none of the thylacine sightings has been confirmed, so it is presumed extinct and under the IUCN category can be listed as officially extinct.
	Extinct In The Wild (EW): This is when a species can not be found living in the wild despite exhaustive surveys, but is still known to exist in captivity.
	Critically Endangered (CR): In this case a species is in extreme danger of becoming extinct in the immediate future.
Endangered (E): Those species in danger of extinction because long term survival is unlikely while the factors causing them to be endangered continue operating.	**Endangered (EN):** A species at very high risk of becoming extinct in the near future.
Vulnerable (V): Those species likely to become endangered while the factors causing them to become vulnerable continue operating.	**Vulnerable (VU):** A species is facing a high risk of extinction in the medium term future.
Rare (R): Those species with a small population in Tasmania that are at risk.	

TASMANIA

There are currently more than 650 species listed as threatened under the *Tasmanian Threatened Species Act 1995*, including 471 threatened plants and 182 threatened animals.

Southern Tasmania has a variety of these species which we have a duty of care to protect, focussing not only on the species themselves but also their habitat, including threatened vegetation communities.

Tasmanian devils
Photo: P. Tonelli

TABLE 2: NUMBER OF TASMANIAN THREATENED SPECIES LISTED IN 2014

GROUP	EXTINCT	ENDANGERED	VULNERABLE	RARE	TOTALS
Vascular plants	19	129	65	248	461
Non vascular plants (lichens, mosses and algae)	1	9	4	16	30
Mammals	1	7	1	2	11
Birds	4	18	11	3	36
Reptiles	0	2	4	1	7
Amphibians	0	1	1	0	2
Fish	0	6	7	2	15
Invertebrates	3	32	21	63	119
Totals	28	204	114	335	681

Changes to the landscape as outlined in Table 3 continue to impact on our fauna and flora. Landholders can assist in providing some refuge for threatened species in our region by considering how habitat could be protected or enhanced to benefit any species that may potentially inhabit their land.

TABLE 3: THREATENED SPECIES MANAGEMENT

The processes identified as having the greatest impact on our Threatened Species (fauna and flora).

KEY THREATENING PROCESSES	EXAMPLES OF BIOTA MOST AFFECTED
Clearance of native vegetation	Grassland and grass woodland species, hollow-nesting birds, wedge-tailed eagle
Impacts of pests, weeds and diseases	Species of riparian, lowland open forest and heathland communities, freshwater fish
Degradation of water systems	Aquatic invertebrates, cave fauna, burrowing crayfish, wetland and riparian species
Inappropriate use of fire	Log dwelling fauna, litter and bark invertebrates, some heathland species
Inappropriate and illegal harvesting	Seabirds and marine species, freshwater crayfish, stag beetles
Impacts of stock	Orchids, palatable herbs, riparian flora

SOURCE: *Threatened Species Strategy for Tasmania (2000)*

Unless in accordance with a certified Forest Practices Plan, it is an offence to 'take' a threatened species without a permit. 'Take' includes kill, injure, catch, damage, destroy or collect and can include the destruction of critical habitat for threatened species.

- Threatened Species Protection Act 1995
- Nature Conservation Act 2002

THREATENED SPECIES LINK

The Threatened Species Link is a new easy-to-use website providing management and conservation advice on Tasmania's threatened species. You can find out which species might be on your land, and how to plan around their management and conservation needs: www.threatenedspecieslink.tas.gov.au

Swift Parrot
Photo: C.Tzaros

THREATENED SPECIES - BIRDS

Loss of habitat for breeding and foraging are the main factors affecting our threatened birds. As well as resident birds, Tasmania has a rich variety of migratory birds which swell bird numbers over the spring and summer months.

Thirty seven bird species are listed as threatened. Threatened species include the Swift Parrot, White-bellied Sea Eagle, Forty-spotted Pardalote and the Grey Goshawk. There are 4 extinct species and 22 threatened sea birds and Macquarie Island species including Albatross, Petrel and Tern species.

TABLE 1: THREATENED BIRDS OF TASMANIA

MAINLAND TASMANIAN SPECIES INCLUDE			
		State status (TSPA listing)	Commonwealth status (EPBCA listing)
Accipiter novaehollandiae	Grey Goshawk	E	
Aquila audax fleayi	Wedge-tailed Eagle	E	EN
Botaurus poiciloptilus	Australasian Bittern		EN
Ceyx azureus diemenensis	Tasmanian Azure Kingfisher	E	EN
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	
Lathamus discolor	Swift Parrot	E	EN
Neophema chrysogaster	Orange-bellied Parrot	E	CR
Pardalotus quadragintus	Forty-spotted Pardalote	E	EN
Podiceps cristatus	Great Crested Grebe	V	
Tyto novaehollandiae castanops	Masked Owl	E	VU

TSPA: E=Endangered, V=Vulnerable. EPBCA: EN=Endangered, CR=Critically Endangered, VU=Vulnerable. See Threatened Species Management Fact sheet for further explanation.

GREY GOSHAWK, WEDGE-TAILED EAGLE AND WHITE-BELLIED SEA-EAGLE

These three birds of prey are all threatened in Tasmania.

Tasmania has the pure white form of the Grey Goshawk which is under threat from loss of breeding habitat caused by disturbance and land clearing. This beautiful bird breeds in wet forest, particularly blackwood areas and preys on mammals such as rats, small possums, rabbits and medium sized birds such as thrushes and currawongs.

Free range domestic fowl should have access to shelter in the form of low bushes or structures to retreat under if goshawks are around.

White-bellied Sea-eagles and Wedge-tailed Eagles feed on rabbits, hares, Brushtail Possums and wallabies in sheep grazing areas, but will also eat carrion. It is possible a sick or dead lamb or goat kid may be taken during breeding season and farmers can reduce any risks by lambing close to habitation. Wedge-tailed Eagles are shy breeders, requiring over 10ha of intact bush around the nest and no disturbance during the nesting period.

A young Wedge-tailed Eagle
Photo: P. Wilson.

SWIFT PARROT

Swift Parrots are breeding endemics. They migrate back from mainland Australia in spring to breed.

Following breeding they will feed across their range before flying back to the mainland in autumn. While we can protect their breeding habitat here in Tasmania, loss of feeding habitat in mainland Australia is also impacting on their populations.

They arrive from the mainland to Tasmania during August and nests in hollows in old eucalypts, mainly on the east coast. It has been impacted by loss of breeding habitat, as it relies on very old and dead standing trees in blue gum forests to provide the hollows for breeding. These trees are typically over a hundred years old before they provide the hollows required for breeding. In more recent years some birds have also been found to be breeding in some on the north west coast where large old blue gums can be found. They mainly feed on the nectar of flowering blue gum.

Swift Parrot
Photo: C. Tzaros

MASKED OWL

Like the endangered parrots, this species also relies on hollows for breeding, however as it requires very large hollows, loss of habitat containing very old trees is impacting on this large owl species.

It mainly feeds on rodents, rabbits and small marsupials such as bandicoots and small possums. Another threat is the impact of some rat poisons on the species. Birds picking up sick or dead rodents that have been eating single dose rat poison can themselves be killed. People living adjacent to forest and woodlands should try to use trapping for rodent control and restrict the use of poisons.

Masked Owl
Photo: S. Bryant

THREATENED SPECIES - MAMMALS

There are 33 native terrestrial and 41 marine mammals which are known to occur in Tasmania, of these, 7 marine mammals and 3 terrestrial mammals are threatened under state and federal law.

The main threats to mammals are via disease (e.g. Facial tumour disease in Tasmanian Devils, aquatic fungus Mucoramphiborum in Platypus or toxoplasmosis from cats), road kill and predation from foxes and cats. The clearance of native vegetation and inappropriate use of fire are also contributing to the decline in the range and/or populations of native mammals in Tasmania.

EXAMPLES OF THREATENED MAMMALS OF TASMANIA

EXAMPLES OF THREATENED MAMMALS OF TASMANIA			
		State status (TSPA listing)	Commonwealth status (EPBCA listing)
Thylacinus cynocephalus	Thylacine	X	EX
Perameles gunnii gunnii	Eastern-barred Bandicoot		VU
Dasyurus maculatus maculatus	Spotted-tailed Quoll	R	VU
Pseudomys novaehollandiae	New Holland Mouse	E	VU
Sarcophilus harrisii	Tasmanian Devil	E	EN
Vombatus ursinus ursinus	Common Wombat		VU

TSPA: E=Endangered, V=Vulnerable. EPBCA: EN=Endangered, CR=Critically Endangered, VU=Vulnerable. See Threatened Species Management Fact sheet for further explanation.

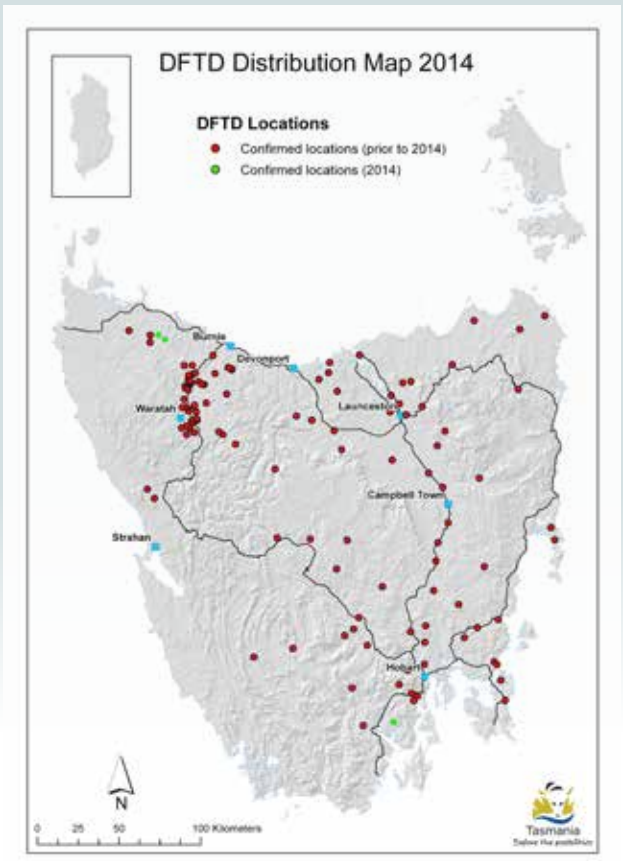
TASMANIAN DEVIL

There is no doubt that persecution led to the extinction of the Thylacine in Tasmania and the process may have been accelerated by a distemper-type disease.

The second largest marsupial carnivore the Tasmanian Devil, whilst also suffering some persecution, exacerbated by road-kill, is now also under dire threat from the facial tumour disease. This species is listed as endangered under both the *Tasmanian Threatened Species Protection Act 1995* and *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. Originating on the east coast of Tasmania, the disease is spreading across the State and in June 2012 was recorded at low levels as far west as Takone.

Where the disease has been prevalent for some years (particularly east coast area), the populations have been reduced by up to 95%. The lower number of devils and the resulting higher levels of carrion in the landscape allow other introduced carnivores (cats, dogs and potentially foxes) to flourish at the expense of native species.

Tasmanian Devil
Photo:
I. Williams



Spread of Facial Tumour Disease to 2014
Source: *Save the Tasmanian Devil Program*

Devil infected with DFTD
Source: *Save the Tasmanian Devil Program*

Predominantly a scavenger, the devil is also a capable hunter, with its main diet composed of living and dead wallabies, various small mammals and birds along with carcases of farm animals. With extremely powerful jaws and teeth, the devil will devour entire carcasses including the bones, skin and fur. DPIPWE have carried out quite a bit of diet analysis around the State recently and have found that Brushtail Possums are one of their favourite prey species.

Landholders can play their part in protecting the devil through slowing down on the roads at night, removing dead wildlife from roads where safe to do so and ensuring domestic fowl are in devil and quoll-proof chook pens. Devils will use fallen logs and occasionally wombat burrows as den sites, so it is recommended any potential sites be retained on your property.

Tasmanian devils
Photo: P. Tonelli

Report sightings of diseased devils or road killed devils to the Save the Tasmanian Devil Program.

SPOTTED-TAILED QUOLL

The second largest living marsupial carnivore, the Spotted-tailed Quoll is a threatened species and listed as rare in Tasmania and vulnerable under the Commonwealth EPBC Act.

Most common in the north and west of Tasmania, the Spotted-tailed Quoll prefers wet forests and scrub and is an active and agile hunter. It will prey on small or injured wallabies, rats, reptiles, birds (including chickens) and invertebrates.

This species is under threat from loss of habitat, persecution, roadkill and competition from other predators such as cats, dogs and foxes should they become fully established.

Spotted-tailed Quoll
Photo: P. Tonelli.

EASTERN BARRED BANDICOOT

Eastern barred Bandicoot
Photo: B. Brown

Virtually extinct in the wild on mainland Australia, there is still a functioning population in Tasmania.

The Tasmanian population has suffered a downturn in numbers over recent years through threats such as loss of habitat, predation by cats, dogs (and potentially foxes) and the disease Toxoplasmosis (carried by cats).

Farmers value the bandicoot for their ability to reduce numbers of pasture pests such as corbies and grass grubs, and many are now planting undergrowth species to provide shelter, nest sites and habitat for the Eastern barred bandicoot.

Feral Cat
Photo: Alison Taverton

INVASIVE SPECIES

The Australian Pest Animal Strategy identified that 11 of Australia's major invasive animal species "are conservatively estimated to have impacts valued at over $720 million annually".

Invasive species are one of the biggest threats to biodiversity and agriculture in Tasmania. They have the potential to harm not only our environment but also our economy, lifestyle and even human health. Invasive species currently cost the state millions of dollars each year in lost production and management costs, and have far reaching impacts across all sectors of the community.

Currently Tasmania is free from many invasive species that, on mainland Australia, damage crops, spread disease, threaten the survival of native animals and disturb ecosystems. Without community action, the situation in Tasmania could change rapidly and we need to be vigilant and prepared to rapidly respond to the threat posed by new and emerging invasive species. We also need to work together to manage the impacts of invasive species already established in Tasmania.

Feral Cat
Photo: D. Marshall
Courtesy of Invasive Animals CRC

The number of naturalised species that become pests (those species that pose a threat to human health, primary production and/or the natural environment) and environmental pests (those pests that specifically impact on environmental values) in Tasmania, 2001 is shown in Table 1 on page 2. *The State of the Environment Report* notes that "Not all naturalised species become pests and not all pests become environmental pests."

TABLE 1: EXAMPLES OF THE IMPACT OF SOME OF THE MAJOR & POTENTIAL INVASIVE SPECIES IN TASMANIA

The table below gives examples of the impact of some of the major & potential invasive species in Tasmania

INVASIVE SPECIES	ENVIRONMENTAL /ECONOMIC IMPACTS
LAND	
European Red Fox	Predation of native mammals and ground nesting birds. Many marsupials are already extinct due to fox predation on mainland Australia. The economic losses of livestock from fox attacks could equate as a much as $20 million per annum in Tasmania's sheep industry alone (wool and slaughter). Foxes are a major contributor to Australia's world highest extinction rate.
Feral Cat	Prey upon native mammals, birds, reptiles (particularly skinks), frogs, fish and invertebrates. Economic losses of livestock through disease.

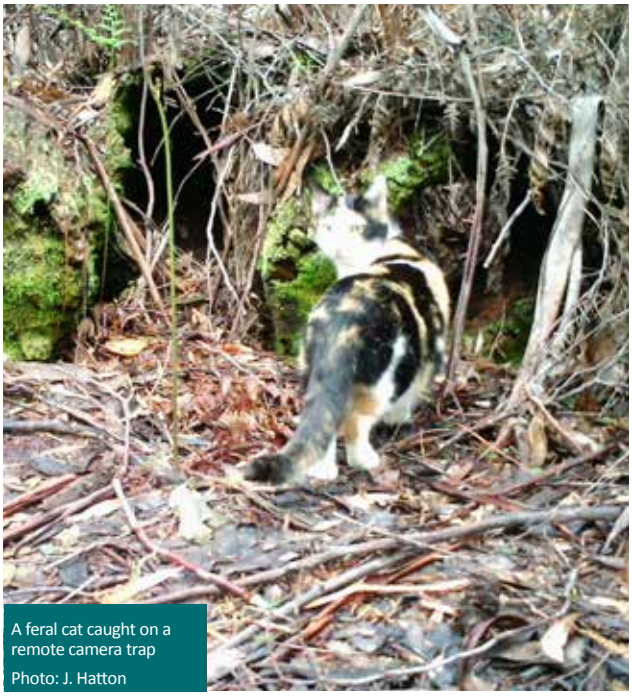
INVASIVE SPECIES	ENVIRONMENTAL /ECONOMIC IMPACTS
	LAND
Rat	Prey upon native birds, reptiles (e.g. skinks) and invertebrates. They have the potential to introduce disease. They have particularly devastating impacts on smaller sea bird populations (e.g. fairy prions and diving petrels) as they predate on the eggs, babies and adults.
Ferret	Ferrets are very successful predators. They prey on for example ground nesting and burrowing birds and native mammals. They also have the potential to introduce disease.
European Rabbit	Over-grazing, changes to vegetation structure, habitat losses to flora and fauna, soil erosion from burrows.
European Starling	Occupy and degrade nesting hollows needed for breeding of native birds, such as the already threatened orange-bellied parrot.
European Wasp	Prey upon many native invertebrates with as yet unstudied consequences.
	INLAND WATERS
European Carp	They destroy fragile water plants, destablise banks resulting in habitat loss for native fish and trout. Do not predate on native fish. However, they predate on invertebrates, thus competing with native fish for food.
Goldfish	Do not predate on native fish. However, they predate on invertebrates, thus competing with native fish for food.
Eastern Gambusia	The eastern Gambusia is listed as a controlled fish under the *Inland Fisheries Act 1995*. They out compete native fish especially in degraded systems and attack small native fish.
Mainland Yabby	They impact native habitats as they destroy aquatic vegetation, destablise banks resulting in habitat loss for native fish and troutand have the potential to introduce disease. Due to their burrowing nature they also damage farm dams, which may cause leakage problems.
Freshwater turtles	Tasmania has no native freshwater turtles and any freshwater turtle spotted in Tasmania is an invasive species. It is also illegal to import or keep turtles as pets in Tasmania and severe penalties apply. DPIPWE's Wildlife Management Branch has responsibility for managing the response to sightings of freshwater turtles in the wild in Tasmania.
Didymo	Didymo, also called rock snot, is a freshwater algae that is widespread in the Northern Hemisphere and New Zealand. Although not currently in Australia, it is highly invasive and is considered a significant risk. Didymo poses a significant threat to Tasmania because of the potential transfer from NZ via contaminated fishing and boating equipment.

SOURCE: *State of the Environment Tasmania (2003), Animals Pests*

CATS *FELIS CATUS*

Cats are known to prey on at least 50 Tasmanian species including 15 threatened species. The cat competes directly with native carnivores and impacts on wildlife through predation, competition and the spread of diseases such as Toxoplasmosis. Toxoplasmosis can be transmitted to humans and other mammals; it kills native animals and can cause abortions in sheep and goats.

It is believed that the population is rising in response to the decline in population of the Tasmanian devil through the Facial Tumour Disease. New legislation came into effect on July 1st 2012 which permits only registered breeders to breed cats. "Cats sold or given away must be more than eight weeks old, desexed and microchipped."



A feral cat caught on a remote camera trap
Photo: J. Hatton

CATS *FELIS CATUS (CONT)*

The Cat Management Act 2009 came into effect of 1 July 2012 to helps landowners better manage the impacts of feral cats and regulate breeding of domestic cats. The Act provides statutory powers for primary producers, land owners and land managers to trap, seize or humanely destroy stray and feral cats in certain circumstances. Councils can also declare cat management or prohibited areas in their municipality after a public notification process.

It is important that the domestic cat population does not provide a source of recruitment for the feral cat population and, with responsible pet ownership, this can be achieved. Microchipping and desexing domestic cats not only helps prevent unwanted kittens from becoming feral cats but also has important animal welfare benefits. Desexed cats are less likely to wander and be injured in traffic or fights; microchipping a cat allows more rapid return to the owner if a cat has wandered (reducing the stress on cat and owner alike). Cat owners can further assist in reducing the environmental impact of their cats by confining them to their properties, particularly if they live near bushland.

Further details about cat management can be found on the invasive species section of Department of Primary Industries, Parks, Water and Environment website or by contacting your local council.

Factsheets Courtesy of Department of Primary Industries, Parks, Water and the Environment

EUROPEAN RABBIT *ORYCTOLAGUS CUNICULUS*

With the ability for a pair of rabbits to produce 30-40 offspring in a year, the population of rabbits can increase rapidly when conditions are right.

On farms they compete with livestock for pasture (8 rabbits can eat the equivalent pasture of 1 sheep), impact on native vegetation and can change the composition of the vegetation communities. At high levels they can eat the grass down to bare soil, leaving it open to erosion and weed infestation.

High population levels also result in a rise in predator numbers which allows populations of species such as the feral cat to increase with a flow on effect on wildlife from higher predation levels and spread of disease.

Control measures for rabbits should aim to reduce the resident population by more than 90% otherwise, with the rabbits breeding rate, the population will return to pre-control levels within one breeding season. Usually several methods are required to make an impact on the population. Where rabbit numbers are excessive and causing significant impacts, DPIPWE can advise landowners on management options.

EUROPEAN STARLING *STURNUS VULGARIS*

European Starling

Photo: B. Lukins Courtesy of Invasive Animals CRC

Released in the 1880s to control insect pests eating European and pasture plants, the European starling is now so common in Tasmania it is hardly noticed any more.

It will compete with native birds for food, will destroy habitat and competes with native hollow dependent fauna for nest sites. It is known to "directly impact on Orange-bellied Parrots by using tree-hollow nest sites and by killing incubating females at nest" (*State of the Environment Tasmania 2009*). Starlings build nests in a wide range of sites including roof spaces, protected areas in wood piles, old guttering and pipes, hollows in trees as well as nesting boxes put up for native fauna.

MAINLAND YABBY *CHERAX DESTRUCTOR*

Hardy and quick maturing, the Mainland Yabby will start breeding from 6 months of age (compared to 14 years for female Giant Freshwater Lobster) and can spawn 2-4 times a year (every 2 years for giant freshwater lobster).

Tolerant of higher temperatures and able to burrow to survive drought, this species will outcompete native species, displacing endangered burrowing crayfish, reducing water quality, encouraging algae blooms, eroding stream banks and damaging dam walls. It may also carry diseases and parasites to which our native species have no resistance. Mainly found in farm dams at present, the Inland Fisheries Service needs community support to eradicate this species before it invades all our natural waterways.well as nesting boxes put up for native fauna, are used by these birds.

FERRET *MUSTELA FURO (POLECAT)*

The Ferret is another species to be alert for - a few small populations are known in Tasmania. It is a ferocious hunter of anything small enough to tackle (small ground-dwelling birds, reptiles, amphibians, mammals and invertebrates).

EUROPEAN RED FOX *VULPES VULPES*

Tasmania has a long history of fox introductions, with foxes being introduced for recreational hunting in the 1800s.

More recently, a range of evidence indicating fox activity in Tasmania triggered the start of an eradication effort aimed at ensuring that foxes were not able to establish in the state.

As at July 2014, no evidence of fox activity has been collected in Tasmania since July 2011, which is a positive sign that establishment has been prevented.

However, the presence of large numbers of foxes on mainland Australia means that the threat from fox incursions remains. Ongoing vigilance for fox activity is needed to ensure Tasmania does not risk suffering the same impacts from foxes as mainland states.

Foxes are a significant factor in the decline and extinction of many small and medium-sized mammal species in Australia. They also prey on many bird species. 78 species of native vertebrates (birds, mammals, frogs and reptiles) would potentially be impacted in Tasmania, not to mention the impact foxes would have on farming and the economy. Foxes may also compete with Tasmania's native carnivores and occupy niches usually held by quolls or the Tasmanian Devil.

Biosecurity Tasmania monitors for foxes in Tasmania through a strategic vertebrate pest monitoring program that searches for evidence of threats using a variety of measures, including scat (animal poo) collection surveys with the use of scat detector dogs.

European Red Fox

Photo: C. Cox
Courtesy of Invasive Animals CRC

It is important that all members of the public are vigilant and report fox sightings or any possible evidence of fox activity to DPIPWE's Invasive Species Branch.

INTRODUCED WASPS

VESPULA GERMANICA (EUROPEAN WASP)
VESPULA VULGARIS (ENGLISH COMMON WASP, YELLOW JACKET)

Accidental introduction, probably of hibernating queens to Tasmania in 1959 for the European Wasp and 1995 for the English Wasp.

These species can cause major economic losses in vineyards and orchards, and will also actively hunt invertebrates. They are thought to be implicated in the decline of the Ptunnara Brown Butterfly found in native grasslands. They are known to rob beehives, kill bees and fledgling birds, and will compete with native birds and bees for nectar. With a painful sting, which can cause allergic reactions in some, the wasps can deter people from enjoying outdoor activities where they are at high densities.

Factsheets
Courtesy of Invasive Animals CRC

NATIVE PESTS

MACROPUS RUFOGRISEUS RUFOGRISEUS - BENNETTS WALLABY

THYLOGALE BILLARDIERII - PADEMELON

TRICHOSURUS VULPECULA FULIGINOSUS - BRUSHTAIL POSSUM

The Pademelon and Bennetts Wallaby (and Brushtail Possum in some areas) are abundant in Tasmania and their numbers and distribution have expanded over the past 30 years.

Land clearance in conjunction with improved pastures and water supply, along with reduced hunting pressure, have provided ideal conditions for increasing populations of these species.

Land clearance has resulted in a mosaic of pastures and remnant bushland which has provided ideal habitat enabling wallabies to feed at night on improved pasture and retreat to adjacent bushland to shelter by day. Studies have shown an average of 65% of pasture production is lost from rested paddocks near bushland (and within 20 metres of bush, up to 90% of pasture production can be lost) to wildlife browsing. If the landholder believes that there is a problem with wildlife browsing, this can be quantified by measuring pasture loss using exclusion cages as outlined in the Measuring Pasture Loss to Browsing Animals sheet (See References). If the losses are confirmed there are a few options to reduce the problem.

Wallaby-proof fencing has been shown to be one of the most successful methods to control browsing, however this is expensive and should

Bennetts Wallaby

be planned in conjunction with neighbouring properties so that the problem isn't merely shifted or populations isolated. Reducing the population before fencing remnant bush can avoid high-density wallaby populations impacting on the understory

A permit is required to "take" (which covers to kill, injure, catch, damage, destroy or collect) wallabies and Brushtail Possums, which are classified as "Partly Protected Wildlife" under the Wildlife Regulations 1999 of the *Nature Conservation Act 2002*. Game Management Services Unit (See References) will assist in developing a Property-based wildlife Management Plan with control options which include using wallaby proof fencing as a control measure.

Canary bloom
Photo: Cassie Strain

WEED MANAGEMENT

Australia's National Weed Strategy defines weeds as a plant that requires some form of action to reduce it's harmful effects on;

1. The economy
2. The environment
3. Human health and amenity

A weed is a plant growing in the wrong place. Tasmania contains some of the most productive agricultural land in Australia; the climate, soils and rainfall are good for growth and the weeds benefit from these conditions too.

We want to protect our agricultural industries and the environment, by keeping weeds to a minimum.

"Weeds reduce farm and forest productivity, displace native species and contribute to land degradation. The cost of weeds to agricultural industries is estimated at about $4 billion a year. The cost of weeds to the environment is difficult to calculate but could be greater than the estimated cost to agricultural industries"

- Department of Agriculture, Fisheries and Forestry

There are different types of weeds:

DECLARED listed under the *Tasmanian Weed Management Act 1999*, these weeds MUST be controlled under the law.

AGRICULTURAL invades crops and pasture and costs money, time and control measures can impact on the natural environment.

ENVIRONMENTAL often garden plants which escape and multiply in the natural environment and out compete native plants.

Currently there are approximately 115 weeds declared under the *Weed Management Act 1999* in Tasmania. Particular plants become listed as declared weeds because of the level of threat they present.

There are a number of declared weeds that are widespread and common in the region / state such as gorse, brooms, blackberry, Spanish heath, and willows. Control measures for these weeds should be implemented to ensure that further spread in the state / region is prevented and their impacts on the environment and Tasmania's agriculture are reduced.

These are listed on the Department of Primary Industries Parks Water and Environment (DPIPWE) website.

It is important to be able to recognise different weeds and the DPIPWE website is very helpful with many photos.

The declared weeds which create our biggest problems in Southern Tasmania include:

- gorse *Ulex europaeus*
- ragwort *Senecio jacobaea*
- pampas *Cortaderia* spp.
- blackberry *Rubus fruticosus agg.*
- broom *Genista monspessulana* and *Cytisus scoparius*
- spanish heath *Erica lusitanica*
- californian thistle *Cirsium vulgare*
- willows *Salix* spp.
- african boxthorn *Lycium ferocissimum*
- boneseed *Chrysanthemoides monilifera*
- St John's Wort *Hypericum perforatum*'

Like all plants, different weeds have particular preferences for habitat. For example amongst the declared weeds you will mainly find Boneseed, African boxthorn and Asparagus species near the coast.

A weed management plan (WMP) has been written for all Tasmanian declared weeds. The WMP will state according to each municipality whether a particular declared weed is widespread or isolated in occurrence, and therefore if the goal is eradication or control.

Environmental Weeds

Environmental weeds are often common garden plants and usually spread by birds or garden waste dumped inappropriately. Coastal properties and bush areas can be particularly vulnerable to environmental weeds such as:

- asparagus fern (also declared)
- cotoneaster
- fuchsia
- agapanthus
- holly
- ivy
- mirror bush
- foxglove
- sweet pittosporum
- perriwinkle

Gorse *Ulex europaeus*
Photo: N. Crane

weed control

When controlling weeds a big decision is what method to employ, and the options include mechanical, chemical, biological or manual removal. By far the best outcome though is covered by the saying "prevention is better than cure" so good hygiene is very important. Ensure contractors only bring clean machinery onto your property because "one year's seeds makes seven years of weeds".

Weed Spread

Weeds spread in the environment as plant material or through seed dispersal. Plant material might be dumped garden waste, whereas seeds are naturally dispersed by:

- animals and birds
- wind and water
- soil movement
- seed pod actions

Unintentional spread of weeds occurs with:

- topsoil on machinery moved from one area to another;
- gravel and quarried materials contaminated with seed such as gorse and broom;
- soil on peoples' boots;
- along roadsides where vehicles produce air currents which move wind blown seed;
- hay making machinery or hay bales moved from one area to another;
- fodder, grain or birdseed.

Agricultural Weeds

Some agricultural weeds are also declared weeds, such as ragwort and californian thistle. Other agricultural weeds, for example, wild radish and capeweed, are not declared but can be costly to control, and in many cases are toxic to stock. These include:

- spear thistle
- capeweed
- wild radish
- dock
- cumbungi
- *Glyceria maxima (Poa aquatia)* reed sweetgrass

PLANNING WEED CONTROL

When planning weed control consider:

- Which method or combination of methods – mechanical, chemical, biological or manual
- Mechanical control may result in weed heaps which need to be burnt, therefore the placement of the heaps needs to be thought out, and whether a fire permit will be necessary
- Special precautions if using chemicals in waterways
- Estimate a patch size that you can manage to control, and only take on an area where you know you can carry out **follow up** work. A lot of time, effort and money is wasted in weed control by not being able to **follow up**
- Making your plan site specific
- New weed incursions which may result from drought, fire, flood, contaminated vehicles and farm equipment, imported feed and other materials
- Practicing strict bio-security measures and designating specific vehicle and equipment wash-down areas, monitor for new weed incursions, for example in new feed out areas for livestock
- Start with smaller, outlier patches and work into the largest patch
- Time of year is critical for successful weed management, herbicide treatment should only be employed on actively growing plants before they flower and set seed
- The mantra for effective weed control is **follow up follow up follow up**
- All plants are like us and need a space to live. Weeds are often plants which rapidly colonise bare ground and out compete other plants. When planning weed management, don't leave bare ground for more weeds to re-colonise. The timing for re-planting with beneficial plants is critical though, not too soon in case soil stored seed germinates, but before other weeds take over the bare ground.

HEAVY MACHINERY

Heavy machinery such as an excavator or dozer can be used for raking up dense woody weed infestations, for example gorse, or removing willows from rivers and streams in conjunction with the cut stump and paint method.

A mulching machine or meri-crusher attached to a tractor is another method of gorse control which mulches the gorse material.

Heavy machinery can be a good, initial option if weed infestations such as gorse or broom are large and dense. However, mechanical control creates soil disturbance, so landholders need to be aware that after the initial control, a mass germination will occur from soil stored seed, and the mantra **follow up** control, is imperative.

An excavator can also be used for the removal of riparian and aquatic weeds *Glyceria maxima (Poa aquatia)* and cumbungi *Typha* spp. The benefits of mechanical control mean that less chemical is being applied, particularly if the target weeds occur in a waterway. However the machine operator needs to be very careful not to alter the structure of the waterway. Also consider that the excavated material (gorse or Glyceria or willows) still needs to be disposed of, which may require burning the heap.

Mulching machine at work on a dense gorse infestation

Photo: N. Crane

Mass germination of soil stored seed after gorse removal

Photo: A. Fergusson

MANUAL REMOVAL

The Bradley method was pioneered by two sisters in Sydney who wanted to remove weeds from bush areas.

The method revolves around minimal disturbance, hand weeding if possible, and allowing native vegetation to re-establish naturally. Importantly start with the outliers, small isolated patches and work into the thickest patch of weeds. Also don't clear large patches of weeds at one time which results in bare ground and weeds recolonising; give natives a chance to germinate and establish ground cover before removing the next patch of weeds.

Hand pulling can be very successful as long as it is followed up. Other manual removal methods are: cut and paint method where the stem or trunk of the weed (gorse for example, is cut with a saw and then Glyphosate is applied to the cut stump, within 30 seconds of cutting). This method results in much less chemical in the environment, the chemical is not applied with a sprayer so is safer for the operator and results in targeted application. The cut material will still need to be disposed of appropriately.

Controlling weeds in or near waterways is especially challenging. By law a person must not apply chemicals within 0.5 km up-stream of potable water intake in flowing water (a river or stream), or within 0.5 km of a potable water intake in a standing body of water such as a lake, pond or reservoir. Roundup Bioactive® or Weedmaster 360® without added surfactants are the only safe option for infestations near waterways (these are the only herbicides registered for use near waterways).

Remember to correctly identify your target weed. There are several native plants which are similar to some target weeds such as:

gorse *Ulex europaeus* - native gorse *Daviesia ulicifolia*

spanish heath *Erica lusitanica* - common heath *Epacris impressa*

cumbungi *Typha* spp. - 2 species are introduced, 1 species is native

Currant bush *Coprosma quadrifida* - spiny and may look a worry, but is a native and produces berries for native birds

Ragwort and blackberry

Photo: D. Lucas

BIOLOGICAL

A number of different biological control agents are used in Tasmania. For example, the gorse spider mite lives in colonies on the host, covered by a web and feeds on the gorse plant. Often biological control weakens the host, or interferes with the fertility of the plant, but may not kill the host.

CHEMICAL

We would all like to use fewer chemicals in the environment, but sometimes the careful use of chemicals can result in less physical disturbance to a site.

Spraying in a sensitive area an operator is using correct personal protective equipment as well as a dye in the spray

Photo: J. Cooper

In a particular situation it may be possible to use the cut and paint method, or drill and fill which are very target specific applications, rather than spraying which has the potential to harm non-target plants. The most important message for chemical use is to READ THE LABEL, and mix only at the rates as directed. Use the correct chemical for the task and please consider your own safety and biodiversity. It is possible to look at chemical labels and Material Safety Data Sheets (MSDS) on line before purchasing chemicals, and guidelines are also given on DPIPWE weed website under the chemical control link for specific weeds.

ChemCert courses are run periodically in all states; these courses are accredited and cover safe chemical handling and use. For more information visit their website: **www.chemcert.com.au**. Wearing the correct protective equipment is essential, and can include gloves, face mask, long sleeved shirt and trousers as a minimum.

Californian thistle and hemlock

Photo: A. Hughes

HEALTHY WATERWAYS

BENEFITS OF HEALTHY WATERWAYS ON YOUR PROPERTY

Healthy waterways support a healthy environment and are vital for our social and economic wellbeing. They play a key role in agriculture, industry and recreation and provide essential habitat for wildlife including many rare and threatened species.

The land that immediately surrounds waterways is some of the most productive fertile land we have and is known as riparian land. Riparian land is described as the part of the landscape adjoining rivers and streams that has a direct influence on the water and aquatic ecosystems within them ,so it is important to manage this land sensitively, as down stream effects impact on both production and biodiversity". It includes the stream banks and a strip of land of variable width along the banks.

The benefits of riparian vegetation in good condition include:

Biodiversity

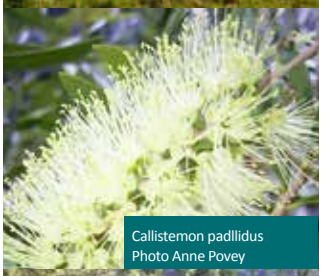
- Landscape refuge for native flora and fauna
- Corridors for wildlife to move through the landscape
- Habitat for rare and threatened species
- Contributes to water availability and nutrients cycling on a property and landscape scale
- Healthy aquatic life including fish: riparian vegetation creates shade therefore regulating water temperature and sheds timber into waterways that is used by fish for shelter, feeding and spawning

Productivity

- Water resources used in agriculture and industry
- Stock management and shelter: riparian vegetation creates shade and acts as a wind break
- Supports biological agents, such as predatory species that control pests of crops and pasture
- Increase in capital values
- Opportunities for diversification such as ecotourism, fishing tours, amenity for accommodation

Soil and water conservation

- Reduces erosion and retains sediment by physically slowing water and wind movement
- Maintains river courses: stabilises soil surfaces through the action of roots, organic matter and increased infiltration
- Lowers the water table through root action reducing water logging and salinity
- FIlters pollutants from surface water flows: ground cover plants and the litter layer help filter out pollutants before they reach the waterways



Callistemon padllidus
Photo Anne Povey

Aesthetics and well being

- Provide a connection to place
- Support recreation (bird-watching, bush walking, fishing)
- Provide landscape values
- Preserving original landscape
- "Spiritual, therapeutic effect"

CHARACTERISTICS OF RIVERS

The characteristics in the following table are based on a river* typically found in the mid to upper reaches of a catchment, immediately downstream of a mountainous area or hilly bedrock dominated headwater. This type of river is classified as a 'partially confined' river under the River Styles Framework and is commonly found in Tasmania's Huon Valley.

The characteristics of rivers will vary among different river 'styles' depending on where they are situated in the landscape. This will have a direct bearing on their short to long term management. Clearly a mountain river tumbling though a narrow bedrock valley is different to a slow-flowing, meandering river on a flat plain.

Partially confined rivers as the name suggests are able to move to some limited extent within their valley setting compared to the headwaters of a catchment where movement of the channel is restricted by the existing bedrock.

* The generic term "river" is used here to include all watercourses e.g. steams, gullies etc.

Figure: The River Styles Framework has been developed by Macquarie University to classify the character and behaviour of different river systems.

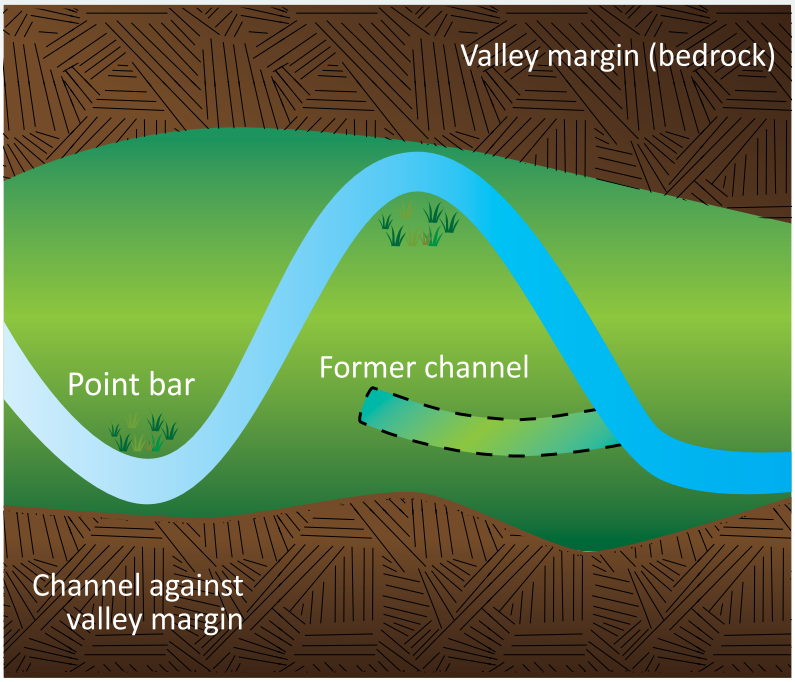
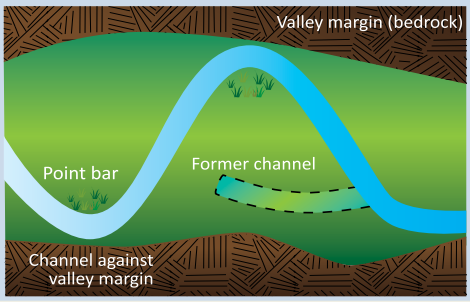


Illustration of a partially confined river

Examples of partially confined River Styles are common in the Huon Valley.

CHARACTERISTICS OF A OF A TYPICAL RIVER IN TASMANIA'S HUON VALLEY - MID TO UPPER CATCHMENTS

CHARACTERISTIC	GOOD CONDITION	POOR CONDITION
Shape of the channel zone 'Partially Confined' river style	A single meandering asymmetric channel with 10% to 50% of the channel against the valley margin. Channel has pools, riffles, point bars (sediment bar on inside bend) and benches (abandoned floodplain). Behaviour: In wider reaches, bends migrate down-stream. Phases of bed lowering are normal. 	Partially Confined rivers in poor condition exhibit straightened channels. Behaviour: Accelerated bed and bank erosion giving rise to channel expansion. Sudden changes in channel position (avulsions).
Floodplain 'Partially Confined' river style	Irregular floodplain surfaces. Presence of former sections of curved channel. Sections of bend cut off when new, shorter channels short cut during high energy floods) Sections of remnant floodplain no longer connected to the river. Some naturally formed ridges (levees)	Short cutting of bends. Lateral movement of the channel that erodes the floodplain. Localised scouring of surface material from the floodplain (floodplain stripping).
Large Woody Debris	Plenty of large wood debris, including large logs, occupy over 10% of the cross section of the river bed. Large woody debris helps trap sediment & helps to "lock" the bed of the river together, which means it plays a key role in erosion control. It also provides habitat and food for aquatic life. 	A river that has been cleared of large woody debris (de-snagged) is vulnerable to erosion (bed lowering) from fast flowing water. 
Riparian Vegetation Photo Rick James	The presence of a range of native riparian plants shrubs and trees growing at the top of a river bank to rushes and sedges (e.g. *Lomandra*) growing on the toe of the bank, will help minimise bank erosion. Native riparian vegetation helps trap soil and nutrients that 'run off' from the surrounding land, preventing them from entering adjoining waterways. Native riparian vegetation provides shade which regulates water temperature. This shading provides the right conditions for aquatic flora and fauna to thrive and prevents the excessive growth of algae and certain aquatic plants (macrophytes). Native riparian vegetation provides an essential refuge and habitat for native plants, animals and birds many of which are threatened. It also provides food and habitat for in-stream life. 	Bank covered in exotic grasses only. Regular areas of bank erosion evident. A bank with little or no vegetation can be subject to four times the erosive force during floods compared to a bank with a good cover of native riparian vegetation. Destabilisation of banks often resulting in massive increases in channel width, channel incision and gully erosion. Significant quantities of nutrients and sediment can enter waterways and adversely affect water quality. Increased nutrient levels (e.g. nitrogen and phosphorus), combined with increase temperatures from a lack of shade, stimulate weed and algal growth. A lack of shade, created by an absence of native riparian vegetation can lead to fluctuating and usually high water temperatures encourage growth of green algae and certain aquatic plants (macrophytes). This may cause major changes in aquatic habitat, reduce oxygen levels in the water column causing a reduction in aquatic fauna, including fish. Significant in-stream vegetation can also lead to slowing of the stream flow and the watercourse becomes broader and shallower, leading to bank erosion. The absence of native riparian vegetation means there is a lack of suitable habitat for native plants, animals and birds including threatened species.

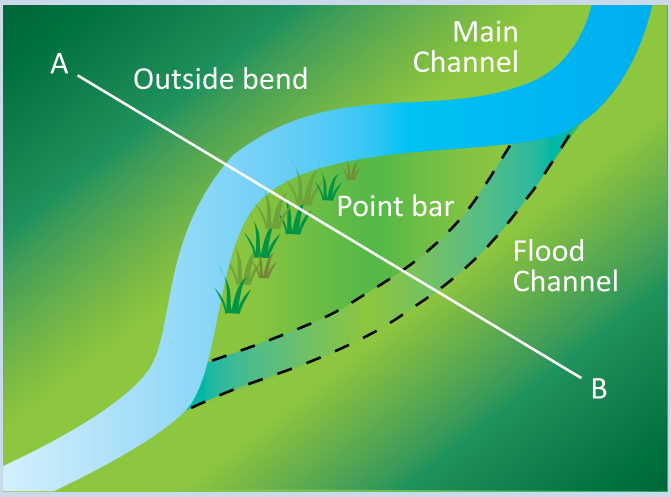
CHARACTERISTICS OF A OF A TYPICAL RIVER IN THE TASMANIA'S HUON VALLEY - MID TO UPPER CATCHMENTS)

CHARACTERISTIC	GOOD CONDITION	POOR CONDITION
Weeds	Few, if any, exotic plants (weeds) occur. If weeds are present, then they are low impact species only that will not affect the regeneration of native plants.	River bank more or less covered with exotic plants including many high threat weeds that will prevent the natural regeneration of native plants. Willow trees can gradually encroach into the centre of a waterway creating a shallower wider water course, which in turn leads to flooding and bank erosion.
Livestock	Livestock should have restricted or controlled access to riparian areas through adequate fencing. If access is occasionally given, this should only be to areas that are not erosion prone e.g. the inside of a bend. Stock should be prevented from entering the water course.	Livestock have free access to riparian areas including erosion prone sections of the channel e.g. outside bends, for water and grazing. This causes baring or pugging of waterlogged areas and watercourse banks, leading to soil compaction and erosion. Livestock will also foul waterways leading to water quality and public health issues.
Landscape health	The surrounding landscape, both native and productive contains little of no bare ground; soils are healthy with good physical structure. These conditions allow rain to easily penetrate the soil profile, vegetation traps sediment and the lack of bare ground means soil is retained in the landscape and is prevented from entering a water course. 	The presence of bare ground and compacted soil resulting from activities such as retaining fallow ground for extended periods, overgrazing and land clearance can lead to significant soil erosion, this can result in soil, nutrients and harmful chemical entering waterways. 
Connectivity	Intact riparian vegetation (along a watercourse) provides connectivity for wildlife, enabling species to access essential resources and new habitat in the landscape. Example below: 	Fragmented riparian vegetation (containing large areas of exotic vegetation and/or cleared land) can prevent native wildlife from accessing essential resources and colonising new habitat in the landscape. Example below: 

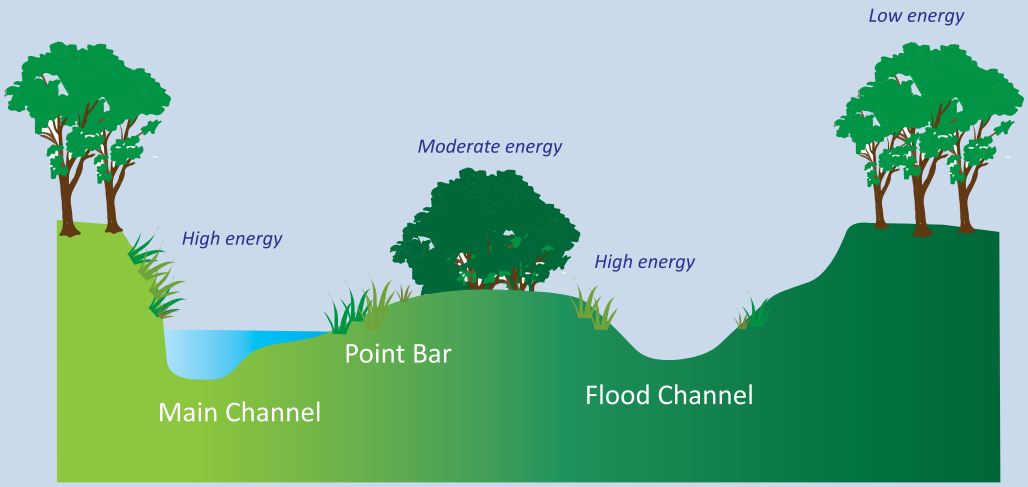
RIVER DYNAMICS AND RIPARIAN VEGETATION

Waterways are dynamic systems, which mean they constantly erode, transport sediment, change course, and flood their banks in natural and recurring patterns. Across the channel zone and river floodplain of a watercourse, the flood energy experienced varies greatly. That is, the energy exerted by the flowing water changes from place to place, with higher energy experienced where the water is deeper and faster flowing, and lower energy where the water is shallow and slower flowing.

Riparian plants differ in their ability to cope with different levels of energy flow and this creates distinct vegetation communities within waterways. The type of vegetation present can often be representative of species that can withstand high or low energy flows. (See 'Managing Waterways' factsheet for revegetation considerations including what to plant where). The following diagrams show the typical variation in water energy flow across the channel of a partially confined watercourse.



River Bend on a Partially Confined River



A. Outside bend Cross Section B

Diagram showing typical bend configuration for rivers in the partially confined River Style family rivers typically found in Tasmania's Huon Valley. In addition to the main channel, a flood channel is located across the back of the point bar feature. As its name suggests, this channel conveys flood flows taking some of the pressure off the main channel. The cross section A – B shows how the energy rating changes across the channel zone. High flow energy is experienced on the outside of the bend in the main channel and within the flood channel. Only plants with the ability to survive high flood energy will grow in these areas. The moderate energy zone between the two channels will have a distinct vegetation community too, while the lower energy bank top and flood plain areas can support a wider range of plants i.e. those that only have a low tolerance of flood forces. See 'Managing Waterways' factsheet for information about planning revegetation work in and around waterways.

MANAGING WATERWAYS

MANAGING WATERWAYS ON YOUR PROPERTY

Waterways and the riparian land surrounding them have undergone significant modification as a result of human activity. In many areas waterways are in poor condition. The modification of waterways has many unintended consequences that can severely impact productivity, social wellbeing and the environment; examples include the loss of productive farm land through erosion, and the loss of biodiversity and clean drinking through contamination of waterways by agri-chemicals, nutrients and chemical fertilisers.

Clearing riparian vegetation to make way for farm land and development, stream channel straightening, gravel extraction and de-snagging of waterways are some example of activities that can lead to widespread bank erosion, lowering of stream beds, localised flooding and the spread of willow and other invasive weeds. It is important to consider the long-term consequences of undertaking activities in and around waterways, which may be well-intended, but can adversely affect the health of waterways further along the catchment, either upstream or downstream.

SIGNS OF AN UNHEALTHY WATERWAY

Bed Lowering

Bed lowering, or bed incision, is erosion of the bed of a river resulting in a deeper channel. Bed lowering can be a natural process (we wouldn't have the Grand Canyon without it!), but accelerated bed erosion i.e. incision at a rate faster than what is considered "normal" for any given river, is viewed as an undesirable erosion problem. Bed lowering is often a precursor to bank erosion as a lowered bed leaves banks unstable. The most common process by which bed lowering takes place is the formation and upstream progression of a head cut. In essence, a head cut is a small waterfall that moves upslope as its face is undercut from the action of falling water. Head cuts are a common feature of gully erosion but can also occur in the bed of a river. Successive waves of head cut progression can significantly lower the bed of a river quickly resulting in bank collapse and channel expansion.


Head cut in top of gully, rock used to slow erosion. Photo Rick James


Two head cuts up degrading creek. Photo Rick James

Bank Erosion

Depending on the river bank erosion can be a natural process. Accelerated bank erosion is erosion above and beyond what would be normally expected for any given river. There are a number of mechanisms by which bank erosion can occur and correctly identifying the cause is essential if effective treatment is to be employed. Some causes include:

- Bed lowering: As the bed drops the "foundation" of the bank is lost. This is usually followed by bank slumping.
- Fluvial scour: The direct scouring of an exposed bank, typically on an outside bend.
- Hydraulic pressure: Groundwater seeping through the face of the bank causing destabilisation followed by slumping.
- Surcharge: The weight on top of the bank that causes collapse e.g. a large tree or building.

Depending on the site, some or all of the above may be operating.


Obvious bank erosion. The underlying cause of bank erosion must be identified if effective action is to be taken. Photo Rick James

DEALING WITH THE PROBLEMS

ISSUE	CAUSES	MANAGEMENT OPTIONS *Permits may be required to carryout certain works . For more information please see section on 'Works in and Around a Watercourse' on page 5 of this fact sheet.	PRO's and CON's
Bed Lowering	1. Disturbance of the bed e.g. de-snagging, excavating holes (gravel extraction, to create a pump hole etc.), moving gravel with an excavator or bulldozer, excessive stock access that breaks the natural armouring of bed materials. 2. Because head cuts in the bed of a river tend to migrate upstream, undisturbed reaches, or entire tributary systems, can be affected by downstream disturbance. 3. It is common for gully systems to be initiated by drainage works e.g. the channel-ization of a valley-fill swamp. Minor "plough lines" pulled through swampy valley-fill have often led to the formation of extensive gully systems. 4. Channel straightening. Cutting off a bend by creating a new straighter channel will result in the water flowing faster (as it now has to travel a shorter distance). Fast flowing water through a created channel with unarmoured bed material often triggers bed lowing.	1. Rock ramp bed controls are typically installed after bed lowering has taken place. The crest of the structure is built above bed level with the intention of trapping sediment upstream thereby raising the bed over time. 2. Rock lined scour pools are typically used to arrest a head cut in a gully system. 3. Timber V-weir bed control. 4. Timber or rock girdles (structures installed at bed level). 5. Re-snagging. 6. On narrow streams, stream-bank revegetation can provide effective bed control over time as the tree & shrub roots spread across the channel.	Rock structures can be expensive if suitable material is not available nearby. Construction is relatively straight forward but does require an excavator or backhoe machine. The materials for timber bed controls are usually cheaper but they are often harder to install. Re-snagging creates natural habitat as well as helping to stabilise the bed. Re-snagging will not by itself stop the upstream progression of an aggressive head cut.
Bank Erosion	Multiple potential causes any one of which, or combination of, may be operating at a particular site. The removal or damage of native riparian vegetation on the bank is usually a prerequisite factor. • Fluvial scour • Slumping • Surcharge • Bed lowering See previous section on Signs of an Unhealthy Waterway for terminology descriptions	1. Realignment & the construction of a log front wall. Revegetation of the bench created between the front wall & the eroding bank. 2. Direct protection of the bank e.g. rock revetment (sloping rock structure), log walls, pinning large woody debris against the toe of the bank etc. 3. Groyne deflection structures e.g. rock groynes, pin groynes (low wall or sturdy timber barrier), log groynes. 4. Gabion (cage containing aggregates such as rock, often used as a retaining wall) baskets. 5. Regeneration of native riparian plants by planting or facilitating natural regeneration e.g. by excluding stock.	Where severe erosion has taken place resulting in a poor bend alignment log or rock front walls can be very effective but are expensive to install. Direct bank protection is typically much cheaper. Using tree trunks with the root ball still attached can be very effective as the root ball acts as a groyne-type structure while the trunk provides direct protection. Gabions are expensive & have a limited life span. As they break down rusty wire is washed into the channel. In all cases, the long term viability depends on the successful establishment of bank-holding native vegetation. In some instances revegetation work on its own is not enough to prevent further head-cut and bank erosion and control structures (as outlined above) will need to be installed to support revegetation or regeneration of native plants. (also see section on Energy Zones in Riparian Zones)

Assessing the causes will assist in developing a plan to address the problems

NATIVE VEGETATION AND WATERWAYS

Native vegetation plays a vital role in maintaining the health of waterways. Existing native species should be maintained and where appropriate actively encouraged to recolonise areas along waterways. This can be achieved by reducing grazing pressure using livestock fencing, allowing early colonising plants such as Silver Wattle to establish particularly in erosion prone areas. In some cases natural re-colonisation by native species is likely to be hindered by the presence of ongoing disturbance and invasive weeds. Revegetation work may need to be carried out in such circumstances and often plays an integral role in restoring the health of waterways. Establishing suitable native vegetation is particularly important in erosion-prone areas where bare ground requires immediate stabilisation. Revegetation should be carried out in conjunction with the removal of weeds, such as willow, and to support newly established erosion control structures. However it is essential that certain factors are taken into consideration when planting native plants along waterways, including the choice of species and where they are situated in and around the channel zone.

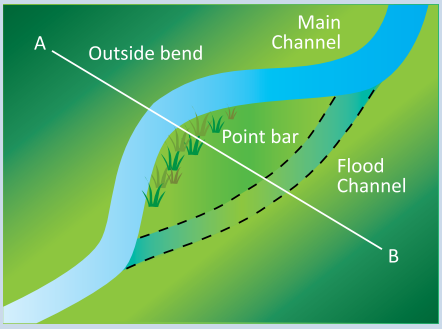
REVEGETATION CONSIDERATIONS

It is important that any revegetation work carried out within the stream channel zone takes the different energy settings into account (see 'Healthy Waterways' factsheet for more information). Some key considerations to look for are:

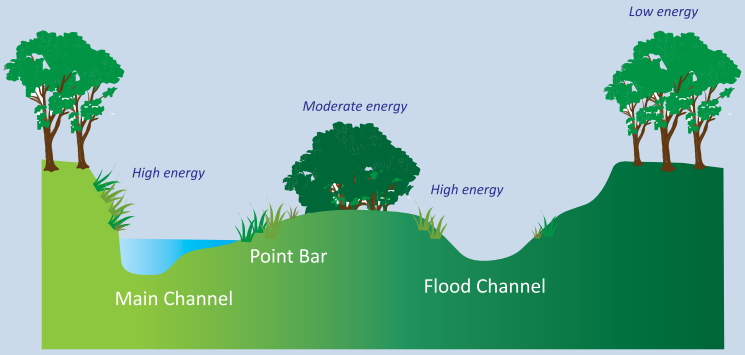
- Before carrying out revegetation works find a section of river similar to the one you propose to carry out works on, but with a good cover of native vegetation. Look carefully to work out what native plants grow where e.g. which ones seem to be able to tolerate high tractive stress? What plants only seem to grow in areas of low tractive stress?
- Plan your revegetation works around your observations – only put plants with a high tractive stress tolerance in high energy areas e.g. on the face of an outside bend.
- It is important to maintain a sufficient width of channel without the restrictions caused by larger shrubs or trees. This is required for the channel to retain its hydraulic efficiency e.g. its ability to convey flood flows. Planting large shrubs and trees on point bars, or within the flood channel zone is not a good idea as this will restrict the channel width over time.

WHAT SHOULD I PLANT WHERE?

Some plant species can hold on in the highest energy areas e.g. on the outside of a bend, while others can only grow where the energy level is low. The following diagrams show the typical variation in water energy flow across the channel of a partially confined watercourse (see 'Healthy Waterways' factsheet for more information).



River Bend on a Partially Confined River



A. Outside bend Cross Section B

The following table provides examples of Tasmanian native plants that are suitable for revegetating land adjacent to and within creeks lines and indicates where particular species should be planted, based on their ability to cope with different levels of energy flow within a waterway (see 'Healthy Waterways' factsheet for more information on river dynamics and vegetation).

ENERGY LEVEL	TYPICAL CHANNEL ZONE LOCATIONS	TYPICAL RIPARIAN PLANTS
High	• The outside of bends. • Flood channels. • Some bank attached bars. • Some mid-channel islands.	woolly tea tree (*Leptospernum lanigerum*) river tea tree *(Leptospernum riparium)* bottlebrush (*Callistemon* spp.) mat rush (*Lomandra* spp.) rushes (*Juncus* spp.) sedges (e.g. *Carex* spp.)
Medium	• Banks along straight river reaches. • The back of point bars.	blackwood (Acacia melanoxylon) silver wattle (Acacia dealbata)
Low	• Upper bank locations. • Floodplains.	black gum *(Eucalyptus ovata)* white gum *(Eucalyptus viminalis)*

*Plant Tasmanian native plants that grow in your local area. Some native plant nurseries may be able to grow native plants with longer root systems on request; these plants are grown in deep tube pots, specifically for the purpose of revegetating riparian areas.

Many species of mat rush (*Lomandra* spp.) are able to grow in areas of a stream channel that experience high energy water flows. The leafy crown offers little resistance to flood flows while the extensive, fibrous root network is highly effective at binding soil together. Lomandra longifolia can often hold fast as the bank it was growing on has eroded. It can sit in the channel in a supporting column of soil that its roots still hold firm. This is an ideal plant for revegetation work in high energy flow areas of the channel.

Stock fencing protecting new riparian plantings

LIVESTOCK AND LANDSCAPE

Livestock should be managed sensitively around waterways. Maintaining good ground cover in surrounding pasture and riparian land is key to improving the health of waterways.

- Over-use of land within a catchment can contribute to a decline in waterway health, particular where over-grazing results in poor ground cover (areas of bare ground) and compacted soil, leading to increased run off and soil erosion.
- Set a grazing regime around waterways that improves perennial vegetation cover and soil health using targeted grazing.
- Where possible use a flexible fence design, such as temporary electric fencing, near waterways. This helps to influence when and where you can graze and how long you rest the site for and can also assist planning for possible flood events.
- Knowing where your stock need to be in the next six months can influence how your riparian zone is managed as part of a planned grazing system.
- Holistic Management® Planned Grazing is one example of a management technique that can help improve ground cover and assist in reducing run off and soil erosion.
- Provide off-stream watering points for livestock. Stock should be prevented from accessing waterways, particularly in erosion prone areas.
- Retain native riparian vegetation to provide a minimum 10 metre width (buffer) upslope (away from) the top of the bank. Where no native vegetation is present, replant suitable native species, especially ground cover plants (see previous section: Revegetation Considerations). For maximum trapping of sediment, nutrient and other contaminants, combine a 10 metre riparian vegetation buffer with a grass filter strip.
- Livestock can be used to manage vegetation near waterways, for example to control woody weeds in a revegetation site, but this requires sensitive forward planning.

Top Left Eroding banks from stock access, Bottom Left Cattle excluded by fencing,
Middle Planned grazing paddocks, non grazed top paddock with weed growth.

WORKS IN AND AROUND A WATERCOURSE

A "watercourse" is defined in the *Water Management Act 1999* as:
'watercourse means a river, creek or other natural stream of water (whether modified or not) flowing in a defined channel, or between banks, notwithstanding that the flow may be intermittent or seasonal or the banks not clearly or sharply defined'.

STEP BY STEP PROCESS FOR WORKS

For low impact works such as tree planting and fencing, steps 1 and 2 would normally suffice. For more complex activities such as the removal of willow using machinery or the construction of erosion control structures it's advisable to follow all 5 steps below. In-stream works may require a permit from your local council or from the Department of Primary Industries Parks Water and Environment (DPIPWE).
The *Water Management Act 1999* does provide powers to require landowners to remove works from a watercourse if it is found to be done without a permit when a permit would have been required. The Water Management Branch at DPIPWE is more than happy to review proposed works and provide guidance to landowners.

Step 1: Establish Land Tenure boundary prior to works

Step 2: Seek advice from Natural Resource Management (NRM) Agencies and Local Councils

Step 3: Seek advice from a river specialist required prior to in-stream works

Step 4: Consultation with the Water Management Branch of DPIPWE
Permits may be required for the following types of works:
*Construction of battens, rock walls on banks or any structures placed in waterways, particularly those that may impede/alter current water flow, use of machinery in watercourses (including management options referred to in this factsheet)

Step 5: Consultation with your local Council planners and Environmental Health Officers to establish if a planning permits required

*Any activities that are likely to have a negative impact on native wildlife, in particular Platypus and their burrows, need careful planning and advice should be sought from DPIPWE's Policy and Conservation Assessment Branch.

In the unlikely event that disturbance or destruction (taking) of a Platypus burrow is unavoidable, a permit is required. Permits are unlikely to be issued for the taking (destruction) of a Platypus and any works must be under¬taken in such a manner that taking of a Platypus does not occur. Avoid major earthworks near or within waterways between December and April (breeding season for Platypus). If this is not practical, further advice should be sought from the Policy and Conservation Assessment Branch.

Please refer to the DPIPWE Wetlands and Waterways Works Manual for further details on working in watercourses and relevant legislation.

Willow and blackberry control at Mountain River, before and after works

MYTHS ON RIVER MANAGEMENT

Myth: Trees cause erosion

The inter-relationship between riparian vegetation and channel form is a complex one. Overall, a river with a healthy community of native riparian plants will be less erosion prone than a similar system where the plant community has been disturbed. It is true that sometimes large trees falling from the bank can leave a large area of exposed bank. Where trees lodge in the channel and deflect flows into the bank erosion can also be triggered. However, these situations where trees are implicated in the cause of erosion are more than offset by the work they do to prevent erosion.

Myth: Bank erosion can be fixed by battering the bank

Battering a steep eroding bank will do nothing to stop the erosion. The only case where this may work is when the battered bank is immediately revegetated with suitable riparian plants and these plants have sufficient time to establish before the next large flood.

Myth: Pushing gravel up against an eroding bank from the bar opposite will protect it from further erosion.

Moving gravel from the low energy side of the channel e.g. a point bar, to the high energy side – an eroding outside bend – will offer temporary protection at best. If the river had sufficient energy to move the material to the point bar then it certainly has sufficient energy to move it away from the higher energy environment on the opposite bank. The gravel will simply be washed away.

Myth: Using concrete for bed controls or bank protection is the best method.

Concrete may be hard, but it's inflexible. Water will always find a way of working around the edges of concrete structures i.e. out-flanking them. Rock structures are more flexible. The overall structure can move to fill any localised scouring while maintaining overall integrity.

Myth: Builder's rubbish, old car and truck tyres and car bodies are all cheap ways of providing bank protection.

Apart from being illegal in many cases, simply dumping rubbish over the bank is unlikely to be effective. However, clean builder's rubble can be used in the core of revetment work and is then "faced-off" with quarry rock.

Myth: Willows and other exotics are better than native plants at providing bank protection.

Willows were used extensively for river bank protection in the past. Many species e.g. Crack Willow (Salix fragilis), strike easily from simple green canes which made establishing them along river banks easy. However, this same feature also means that they can spread quickly throughout the entire system including in places where they're not wanted e.g. in the middle of the channel. In the absence of suitable native riparian plants, willow can temporally protect against erosion and stream bed lowering, but in the long-term is likely to accelerate bank erosion and cause localised flooding. Carefully selected native plants can do the same job in terms of protecting banks from erosion without any of the unintended consequences associated with the use of exotics. Develop a strategic plan for managing willows and consider factors discussed in this factsheet such as where they are positioned along a water course, such as an outside bend.

Myth: Straightening out the channel will solve the bank erosion problems.

Except in rare cases rivers don't flow in straight lines. Straightening a river increases its bed gradient as it now has to travel over less distance per unit drop in elevation. Increased gradient means faster flowing water in a created channel with disturbed bed material. The result is almost always bed incision which leads to further bank erosion.

Willow on inside bend, impacting on erosion on opposite bank

MORE MYTHS ON RIVER MANAGEMENT

Myth: Building levee banks to stop flooding is a good idea.

Levee banks trap more water in the channel during floods. This increases the energy within the channel itself and can trigger bed and bank erosion. As water leaves the channel and spreads out over a floodplain it loses energy and deposits sediment (this is how the floodplain was formed in the first place).

Myth: Vegetation and large woody debris within the channel block it up and cause flooding.

More than 10% of the channel cross-sectional area needs to be blocked before any discernible backwater effect is evident. Many "messy" or "overgrown" sections of channel are well below this figure and as a consequence the vegetation is having very little impact on the hydraulic efficiency of the channel.

Myth: Removing large woody debris(de-snagging) will help high flows get away and reduce flooding.

See comments above regarding the clearing of channels. In addition, large woody debris in the bed of a river often acts like the reinforcing bars in concrete providing extra strength to the overall bed matrix of timber, sand, gravel etc. Removing this reinforcing can lead to bed lowing problems.

Myth: Clearing trees and shrubs off the bank will help the water get away better during high flows so will help reduce flooding.

Water will flow along the face of a well vegetated river bank at approximately half the speed of a cleared one. Or put another way; if you clear the trees and shrubs from a river bank the water flowing along the bank will move twice as fast. Because of the mathematical relationship between water velocity and the energy it contains, doubling the speed (velocity) will result in the moving water having four times as much energy. No wonder cleared river banks tend to erode.

Myth: Planting trees on top of the bank will stop it eroding.

This is partly true, but if the bank is higher than about 2 meters then trees on the top of the bank are unlikely to do much to stop the toe (bottom) of the bank undercutting. Vegetation on the bank face, and at the toe of the bank are required. The one exception to this is where bank erosion is being caused by water seeping through the bank from under the floodplain. In this case trees planted back from the top of the bank can help reduce bank moisture and thus improve stability.

Myth: Allowing stock to graze river banks doesn't do any harm.

As outlined above re. the clearing of vegetation along river banks, banks kept "clean" by stock are prone to attack by fluvial scour. This process works on all the bare areas that stock cause e.g. stock tracks down the bank face, resulting in erosion problems on relatively straight reaches of a riverbank.

Large woody debris providing stability to river bed
Photo: Rick James

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