

# gondwana link

## FITZ-STIRLING FUNCTIONAL LANDSCAPE PLAN

Gondwana Link is one of the largest and most ambitious ecological programs in Australian history. Designed to protect and restore ecological resilience within one of the world's biodiversity hotspots, the completed Gondwana Link will stretch for 1000 kilometres across south western Australia, from the wet karri forests of the far south west to the mallee and woodland on the edge of the Nullarbor plain.

A key focus area is between the Fitzgerald River and the Stirling Range National Parks, or what's known as the Fitz-Stirling area. The biological richness of the parks is well known; Stirling Range National Park contains more than 1500 plant species, including 87 found nowhere else, and at least 138 orchid species or 38% of Western Australia's total. More than 1800 plant taxa have been recorded from the Fitzgerald River National Park, including 62 endemic to the park and another 48 endemic to the park and nearby areas. Equally remarkable is that these two parks only have about 40% of their species in common despite, being only 70 km apart. It is not surprising therefore that the Fitz-Stirling section is so rich in diversity and endemism.

Breakaway at Nowanup,  
in the centre of the  
Fitz-Stirling area.

**Gondwana Link** is one of the most ambitious ecological programs in Australia. A wide range of groups are collaborating to protect, manage and restore bushland in a 1000 kilometre-long pathway, from the wet forests of Australia's south west corner to the woodlands and mallee bordering the Nullarbor plain.

**Fitz-Stirling** section of Gondwana Link sits between the Stirling Range and Fitzgerald River National Parks.





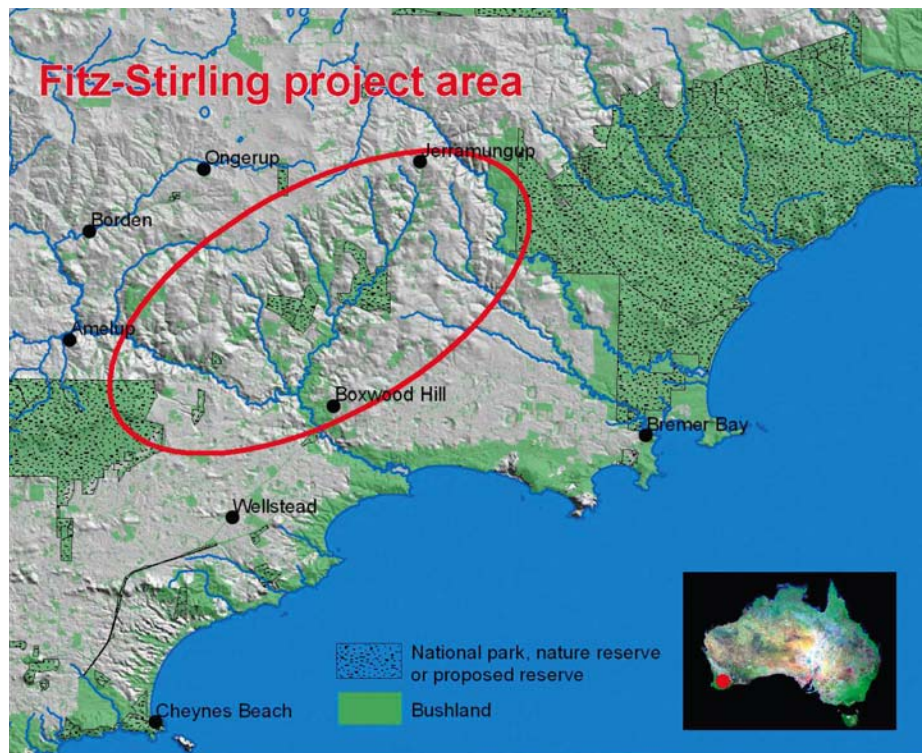
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## WHAT'S AT STAKE



The Fitz-Stirling section covers more than 240,000ha and has lost about two thirds of its native vegetation cover. It extends from the ancient Archaean Yilgarn granites, across the sedimentary Eocene deposits (the Pallinup siltstones which form the spectacular breakaways so characteristic of this landscape), and includes parts of the Pallinup, Bremer and Gairdner river systems. The vegetation includes yate woodlands, mallee heaths and stands of moort, including some that are endemic to this area.

The Fitz-Stirling is home to many species of wildlife including tamar, black-gloved wallabies, echidnas and western whipbirds. Twelve species of mammal, seven species of bird and one reptile that occur here are considered threatened on a state and/or federal level. Many of the flora species and communities are found nowhere else, and are very restricted in their extent even within the Fitz-Stirling area.



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## OUR CONSERVATION VISION



The long term vision for the Fitz-Stirling area is the conservation of an ecologically resilient area where wildlife flourishes alongside a vibrant human community. Connectivity will be restored across the landscape, greatly increasing the chances of species and genes adapting to both long and short-term disturbances, including climate change. Essential landscape processes, such as water, sediment and nutrient cycles, predator-prey relationships and population dynamics, will support healthy natural systems and human environments. Land uses and practices will support the continued evolution of natural systems.



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## WHAT WE WANT TO CONSERVE

We used The Nature Conservancy's "Conservation by Design" process ([www.nature.org/aboutus/howwework/cbd/](http://www.nature.org/aboutus/howwework/cbd/)) to identify six key ecological targets as the focus for our protection and restoration efforts. If we improve the viability of each of these targets, we believe we will improve the ecological condition of the entire system. Each target includes "nested" targets (species or communities with similar needs, threats or situation) and has different characteristics or attributes that need to be considered when developing strategies for their protection.

We have also made an initial assessment of the viability of the targets, as shown in Appendix A on page 11. We are currently gathering more precise information on all of the targets and will then review the viability assessments. Separate information sheets are available for each of the targets.

## CONSERVATION TARGETS WITH NESTED TARGETS

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### CREEK SYSTEMS

- Water rat
- Freshwater crustaceans and other aquatic invertebrates
- Long-necked turtle
- Frogs
- Permanent pools



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### PROTEACEOUS RICH COMMUNITIES

- Chittick community
- Western whipbird
- Honey possum
- Western mouse
- Carnaby's Cockatoo
- Pollinators



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### TAMMAR AND BLACK-GLOVED WALLABIES

- Tammar
- Black-gloved wallaby
- Brush-tailed possum
- Woylie



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### MALLET AND MOORT WOODLANDS

- Rock sheoak
- Corackerup moort
- Chillinup mallet
- Red-tailed phascogale



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### FLAT-TOPPED YATE (OR SWAMP YATE) WOODLANDS

- Upland yate woodlands
- Swamp yate woodlands
- Valley and riparian woodlands



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### FRESHWATER SYSTEMS

- Frogs
- Seed eating birds
- Freshwater crustaceans and other aquatic invertebrates





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## THE CONSERVATION TARGETS



### CREEK SYSTEMS

Creeks within the Fitz-Stirling area flow into the Pallinup, Bremer or Gairdner Rivers. They are important natural corridors for fauna movement and have distinctive communities that are not found elsewhere within the landscape. The permanent river pools provide habitat for fish, invertebrates and aquatic plants, and function as refugia for many species during dry seasons. While the main river systems have in some cases been badly degraded, some of the tributaries, including parts of Corackerup, Chereninup and Peniup Creeks, still contain pools that support native fish species, water rats and long necked turtles. Extensive clearing in the catchments has disrupted the water and nutrient cycles, however, and many pools have already been completely inundated by sediment.



### PROTEACEOUS-RICH COMMUNITIES

These communities are rich in plants from the Proteaceae family, such as Adenanthos, Banksia, Conospermum, Dryandra, Grevillea, Hakea, Isopogon, Lambertia, Persoonia, Petrophile, Stirlingia, Synaphea and Xylomelum. These remarkable communities are extremely diverse and contain many endemic and threatened species that have evolved over millions of years to thrive in the nutrient-poor sands and gravelly sands of this region. Their nectar and pollen production provides an important food source throughout the year, and particularly during summer and autumn, for native birds, mammals and insects. These communities were amongst the most easily cleared during agricultural development and subsequently very little remains—perhaps as little as 16% of the original extent. They are very susceptible to the plant pathogen *Phytophthora cinnamomi* and to other disturbances such as fire, weeds and fertiliser drift.



### TAMMAR AND BLACK-GLOVED WALLABIES

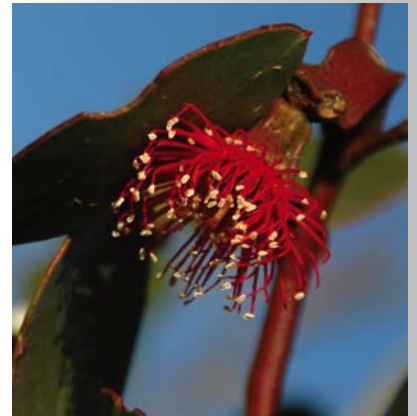
Both the tamar wallaby (*Macropus eugennii*) and the black-gloved wallaby (*M. irma*; also known as the brush wallaby or western brush wallaby) were abundant and widespread within the Fitz-Stirling area until relatively recently. Both are dependent on suitable habitat (low dense vegetation for shelter and more open areas for foraging) and freedom from introduced predators such as foxes. By including the wallaby species as a target and addressing the stresses that are limiting their populations, we will also see benefits to other “critical weight range” species (ie those weighing 35g-5500g) such as the common brush-tailed possum (*Trichosurus vulpecula*) and, in time, perhaps be able to reintroduce threatened species such as the Dibbler (*Parantechinus apicalis*) and Woylie (*Bettongia penicillata*).

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## THE CONSERVATION TARGETS continued

### MALLET AND MOORT WOODLANDS

These are terms used to describe certain eucalypts that don't produce a lignotuber, the woody structure at the base of the stems that allows vegetative recovery after fires. They are also distinct from the mallees (multi-stemmed eucalypts) in being single stemmed. Moorts tend to grow in more or less pure and often dense stands of presumably similar age. Moort species include *Eucalyptus platypus* subsp *platypus*, *E. platypus* subsp *congregata*, *E. nutans* and *E. vesiculosa* (the locally endemic Corackerup moort), and have rounded leaves, strap-like down-turned flower stems or peduncles, and spreading branches. Mallets are slender trunked with steeply angled branches, with the main species in the Fitz-Stirling being *E. astringens* and the locally endemic Chillinup mallet (*E. melanophitra*). These woodlands were included as a target because of their localised occurrence and their specific fire dependencies.



### FLAT TOPPED YATE WOODLANDS

Flat-topped yates (*Eucalyptus occidentalis*), also known as swamp yates, are the most common large tree in the Fitz-Stirling area and one of the few species that provides hollows for native animals such as possums, bats, Carnaby's Cockatoos and owls. Flat-topped yates can occur in three very different parts of the landscape: along creek lines, in and around wetlands (swamps), and in the upland granite country. Within each of those situations, they are associated with a different suite of understorey and ground cover species. About half of all the original flat-topped yate woodlands have been cleared, with the upland yate woodlands suffering even more extensive clearing. The remaining yate woodlands are suffering severe degradation from a combination of stresses including rising saline water tables, fire, waterlogging, insect attack, weed invasion and possibly some other causes that have not yet been identified.



### FRESHWATER SYSTEMS

The Fitz-Stirling area appears to have significant numbers of widespread small occurrences of freshwater in the past. These occurred either adjacent to creeks, in granite systems or in clay pans and most seem to have been lost due to clearing and subsequent land uses. These freshwater sites are believed to play a critical role in the survival of many species, including some dragonflies, mammals, frogs and seed-eating birds and could be expected to also support any species that are sensitive to salinity. While some of those species could now be supported by artificial sources (dams, road drains), it is believed that the loss of the naturally occurring systems may be associated with the loss of some frog species. The aquatic plants and invertebrates that may be associated with the freshwater systems are not well known and further survey work is planned to help us to understand these systems better.



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## IDENTIFYING STRESSES AND THEIR SOURCES



*Dibbler and other animals are affected by predators.*



*The Fitzgerald River National Park has seen many fires in recent years.*



*Continued loss of vegetation adds to the problems of erosion, filling of creeks and poor water quality.*



*Banksia death as a result of *Phytophthora cinnamomi* infection.*

All of the conservation targets suffer from multiple ecological stresses, which together reduce their viability. Our process identified these critical stresses, then drilled deeper to determine the specific sources of those stresses. Identifying the *source* of the stress means that strategies are aimed at removing that source, rather than only addressing the symptoms.

Based on information from surveys, monitoring and personal observations over a number of years, we ranked the main sources of stress for each conservation target in the Fitz-Stirling area (see Appendix B page 12). Amongst the most critical sources are:

- 1. Predation by feral species**
- 2. Inappropriate fire regimes**
- 3. Previous catchment-scale clearing and fragmentation**
- 4. *Phytophthora cinnamomi* dieback and other pathogens of plants and animals**

Other stress sources include invasive species and inappropriate land uses and land management. All have direct impacts on the terrestrial and aquatic ecosystems within the Fitz-Stirling area.

Predation by foxes and, for some species, by feral cats is affecting the populations of not just the wallabies, but many of the smaller native mammals and birds that pollinate the local plants. Fragmentation of the landscape was caused initially by clearing but can be made worse through loss of bushland to salinity, excessive fires, road and other infrastructure development, or continued invasion by weeds. As bushland becomes more fragmented, native fauna become more vulnerable to predation while other ecosystem processes, such as nutrient cycling, water cycling and population dynamics are disrupted. Inappropriate land management such as overstocking adds to fragmentation by removing native plant cover which in turn increases erosion, sedimentation of the creeks and weed invasion.

While fires are a part of natural landscapes in Australia, inappropriate fire regimes can destroy some vegetation types completely, particularly when fires are too frequent or too severe to allow seed to set between fires. Many of the proteaceous family are susceptible to fire, but the biggest threat to them is the spread of *Phytophthora cinnamomi* because it will kill many of the species that are so spectacular and characteristic of the south coast area.



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## OUR GOALS AND OBJECTIVES

### CONSERVATION GOALS & OBJECTIVES

Our conservation goal in the Fitz-Stirling is to **enhance the viability of each conservation target.**

This means that we need to improve the condition, the size and/or the processes that maintain these targets. We also need to eliminate or reduce the threats to them. By doing this for our six conservation targets, we should also improve the ecological health of the rest of the system because many of the processes and the threats are common to many components of the ecosystem.

A lot of work will be required to achieve this, and we have identified four main objectives (below) to focus our actions in the Fitz-Stirling.



## CONSERVATION OBJECTIVES FOR THE FITZ-STIRLING SECTION

### OBJECTIVE 1

By 2012, restore at least 16,000ha of native vegetation, including at least 2000ha of proteaceous-rich communities that support native insect, bird and other vertebrate pollinators.

### OBJECTIVE 2

By 2012, exclude stock grazing and manage foxes, other feral predators, plant pathogens (including *Phytophthora cinnamomi*), and invasive weeds over at least 60,000ha of native vegetation in the Fitz-Stirling area.

### OBJECTIVE 3

By 2012, significantly improve the condition of at least 60% of the creeks within the Corackerup catchment and, by 2017, within the Monjebup and Mid-Pallinup catchments.

### OBJECTIVE 4

By 2017, increase the populations of tammar and black-gloved wallabies within the Fitz-Stirling area by 30%\*.

\*The current population levels of these species in the Fitz-Stirling area are not yet known accurately but are now being studied through the Gondwana Link conservation planning process. As better baseline information is obtained, this objective will be reviewed.

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## OUR STRATEGIES

We designed six strategies to achieve our conservation objectives in the Fitz-Stirling area, all of which involve cooperation with others. Each conservation strategy directly addresses the viability of one or more targets, or the critical threats to the targets.



*Selection of properties for acquisition is informed by the landscape plan. (Strategy 1)*

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### STRATEGIC ACTION 1

*Develop a landscape plan which identifies key areas for implementation of all strategies*

Analysis already undertaken has produced the goals and strategies outlined here. In the next phase, more detailed area planning will identify priority areas for restoration, predator control, reduction of nutrient and sediment input into creeks and re-establishment of hydrological functions.

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### STRATEGIC ACTION 2

*Purchase properties that most effectively deliver Gondwana Link's ecological objectives*

Sufficient ecologically valuable land will be purchased to meet the broad objectives and allow the other strategies to be met. Land capability will be assessed to determine the appropriate locations for restoration to meet ecological outcomes and where commercial enterprises may support those outcomes.

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### STRATEGIC ACTION 3

*Manage properties owned by Gondwana Link groups to demonstrate effective conservation practices in the Fitz-Stirling area*

Properties purchased by the Gondwana Link groups will either be retained in the long term, or they may be restored, have covenants applied over bush and restoration areas and be re-sold. In either case, a high standard of property planning, restoration and management is required. Since threats are not confined to individual properties, working with neighbours is essential to plan and implement management, including for fire and invasive species. Some properties will include demonstration sites for specific restoration techniques.

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### STRATEGIC ACTION 4

*Build integrated management across tenures through partnerships and other collaboration*

We support establishing protective mechanisms on properties not owned by Gondwana Link groups. This may include the development of stewardship payments, covenanting and management mechanisms by agreement with neighbours and other land managers.

A coordinated and widespread fox baiting program will be developed and implemented. While the primary focus is on fox control, management of other introduced species such as rabbits and cats is also needed. This will be most effective if it is undertaken as a coordinated and collaborative partnership with neighbours and key organisations. The potential impacts of unnaturally high population levels of native species such as kangaroos and emus, will also be monitored and action may be taken where these are shown to have a detrimental impact.

Gondwana Link groups will work with neighbours, local governments and Bush Fire Brigades to develop responsible fire management strategies that protect properties while encouraging the development of fire regimes that promote ecological outcomes. Several of the target ecological systems have special fire requirements because they need sufficient time between fires to develop and disperse their seeds.



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## STRATEGIC ACTION 5

### Restore native vegetation systems on geographically and ecologically suitable sites



Restoration of native vegetation systems and their associated communities is one of the main strategies in Gondwana Link.



The target ecological systems (yate, mallet and moort woodlands and proteaceous-rich communities) are priorities for expansion through the restoration work. The viability of other targets, such as the wallabies, will be improved by the inclusion of dense thickets for cover and by planting species such as *Gastrolobium* that are poisonous to introduced vertebrates.

The landscape plan and individual property plans will identify sites that are geographically and ecologically suitable for restoration.

Some of the Gondwana Link groups already have experience in large scale restoration, and will further develop procedures and standards to meet a range of ecological and commercial objectives. Different methods of restoration will be trialed and monitored for long term outcomes for flora and fauna, and to develop a better understanding of the roles of fungi and microorganisms in the Fitz-Stirling environment.

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## STRATEGIC ACTION 6

### Reduce sediment and nutrient loads into creeks by rehabilitating erosion prone surfaces



Reducing sediments and nutrients in the creeks within the Fitz-Stirling (above) will benefit the estuaries (below).



The spatial landscape plan developed in Strategic Action 1 will identify the main areas that are contributing sediment and nutrients into the creek systems. Where these occur on properties owned by the Gondwana Link partners, property plans will identify works, including revegetation and earthworks, to reduce the erosion. Where the sources of sediments and nutrients are identified as coming from other land, the Gondwana Link partners will work wherever possible with those landowners and other organisations to develop solutions.

## Future Strategies

This plan will be reviewed regularly as we learn more about the responses of the landscape and ecosystems to our management. It will be accompanied by additional objectives and strategies for achieving the other important aspect of our vision—the human communities.

## MEASURING OUR SUCCESS

### MEASURES AND MONITORING

The fundamental question facing any team is: “Are our strategies working?” To answer this question, we are collecting data on a number of indicators that gauge how well we are keeping the critical threats in check and, in turn, whether the viability of our conservation targets is improving. A monitoring framework for the viability of our targets has been developed (below) and is now being implemented.



Ecologists from Gondwana Link and the Centre for Excellence in Natural Resource Management (CENRM) are working together on monitoring pools.

TARGET	INDICATORS FOR MONITORING
<b>VIABILITY MONITORING</b>	
Landscape Context	An integrated measure of two factors: 1. the dominant environmental regimes and processes that establish and maintain the target and 2. connectivity.
Creeks	Percentage of catchment under perennial vegetation
Proteaceous-rich communities Mallet and moort woodlands	Distribution of fire age classes
Freshwater systems	Distribution in the landscape
Condition	An integrated measure of the composition, structure, and biotic interactions that characterise the target.
Creeks	<ul style="list-style-type: none"> <li>• Permanent pools affected by sedimentation</li> <li>• Riparian zone condition</li> <li>• Water quality</li> </ul>
Proteaceous-rich communities	<ul style="list-style-type: none"> <li>• Community condition (structure, floristics)</li> <li>• Presence of bird pollinators</li> <li>• Seed set</li> </ul>
Mallet and moort woodlands	Community condition
Yate woodlands	<ul style="list-style-type: none"> <li>• Age classes present</li> <li>• Species richness</li> <li>• Crown condition</li> </ul>
Freshwater systems	Water quality
Size	Size is a measure of the area or abundance of the target. Minimum dynamic area, or the area needed to ensure survival, or re-establishment after a natural disturbance, is another aspect of size.
Proteaceous-rich communities Mallet and moort woodlands Yate woodlands	Percentage of original extent remaining or restored
Tammars and black-gloved wallabies	Habitat occupancy
Freshwater systems	Populations of nested target species
<b>THREAT MONITORING</b>	
Proteaceous-rich communities Tammars and black-gloved wallabies Mallet and moort woodlands	Fire return interval
Creeks	Erosion and sand slugs
Proteaceous-rich communities Mallet and moort woodlands Yate woodlands	Invasive species (weeds) and pathogens



## APPENDIX A.

### VIABILITY ASSESSMENT OF CONSERVATION TARGETS IN THE FITZ-STIRLING AREA

For each target, we identified a number of ecological attributes each of which related to either the Landscape Context, Condition or Size of the target. We then defined indicators for each attribute and ranked the current status of each of these based on our own knowledge and that of the other experienced people we consulted. The rating levels roughly equate to: Poor = Imminent loss of the target; Fair = The target is vulnerable to serious degradation; Good = Minimal integrity, and the target may require some intervention if it is to be maintained in the longer term; and Very Good = Optimal integrity, with the target functioning at an ecologically desirable status with little human intervention required.

VIABILITY ASSESSMENT OF CONSERVATION TARGETS				
Target	Landscape Context <sup>a</sup>	Condition <sup>b</sup>	Size <sup>c</sup>	Viability Rank
Creeks	Fair	Fair	-	Fair
Proteaceous rich communities	-	-	Fair	Fair
Tammars and black-gloved Wallabies	-	-	Fair	Fair
Mallet and moort woodlands	Fair	Good	Good	Good
Flat-topped yate woodlands	-	Fair	Good	Good
Freshwater occurrences	Fair	Fair	-	Fair

a. Our current understanding of 'Landscape Context' is based on maps of the extent of bushland remaining throughout the Fitz-Stirling area (defined as the six subcatchments in the Fitz-Stirling) and vegetation mapped by Ken Newbey in the 1970s. These show that the condition of most targets is only fair because they are outside their range of acceptable variation and therefore vulnerable to degradation.

b. We perceive the condition of the targets to be fair to good, but trends for some of the targets are not clear. We intend to track changes in condition using both remote sensing and ground surveys. 'Condition' includes attributes such as species composition, age distribution and recruitment (for vegetation communities), and water quality (for creeks and freshwater systems).

c. We also used Newbey's vegetation mapping and the extent of remaining bushland to determine the size of the target vegetation communities and determined that less than 20% of the original cover of proteaceous-rich communities remain. The extent of yate and mallet and moort woodlands remaining is greater, but for the yate systems at least, the trend is not good because of the declining condition. The mallet and moort trends are difficult to estimate because the original extent of these woodlands was not mapped. The size estimates for the wallaby species and for the freshwater systems are very tentative so we are gathering more information on these targets.

## APPENDIX B. SUMMARY OF THE SOURCES OF STRESS, FITZ-STIRLING AREA

SOURCES OF STRESS TO TARGETS	Creeks	Proteaceous rich communities	Tammar and black-gloved wallabies	Mallet and moort woodlands	Yate woodlands	Freshwater systems	Overall stress source rank
Inappropriate fire management	Low	High	High	High	Medium	-	High
Predation by feral species	-	Low	Very High	-	-	Low	High
Catchment clearing	Medium	-	High	-	High	Medium	High
Invasive non-native/alien species	Medium	Medium	-	-	High	Low	Medium
Fragmentation	Medium	-	High	-	-	Medium	Medium
<i>P. cinnamomi</i> and other pathogens	-	High	-	-	-	Medium	Medium
Cropping practices	Low	Medium	-	Medium	Low	Medium	Medium
Grazing practices	Low	Medium	-	Low	Medium	Medium	Medium
Development of roads or utilities	Low	Medium	-	-	-	-	Low
Threat status for targets and project	Medium	High	Very High	Medium	High	Medium	High

The overall ranking for sources of stresses for each target is dependent on a number of factors including:

- The severity of impact of the stress (ie will the stresses resulting from this source only slightly impair the target, or destroy it?)
- The scope of damage to the target that could be expected from the stress (ie will it be widespread or very localised?)
- The contribution of the particular source to the stresses (ie does the source contribute all of the particular stress or is it only a small contributor?); and
- The reversibility of the stress (ie is it easily reversible with moderate costs, or essentially irreversible?)

For more information, contact Gondwana Link on (08) 9842 0000, [info@gondwanalink.org](mailto:info@gondwanalink.org) or [www.gondwanalink.org](http://www.gondwanalink.org)



Participating groups in Gondwana Link include: Bush Heritage Australia, Fitzgerald Biosphere Group, Friends of Fitzgerald River National Park, Greening Australia, Green Skills, The Nature Conservancy and The Wilderness Society.