



KIT 2

KEY FEATURES FOR BIODIVERSITY



Queensland
Government



Acknowledgments

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WHAT ARE THE KEY FEATURES FOR BIODIVERSITY, AND WHY ARE THEY IMPORTANT?

Habitat is the physical parts of the environment in which plants and animals feed, breed, and shelter. It includes trees, shrubs, grass tussocks, logs, organic litter, soil and rocks. Some habitat features are particularly important for a range of species, and also tend to alter with management. These are key features for biodiversity, particularly for decreaser species that have special habitat requirements (see Kit 5). These features are therefore the focus of biodiversity condition assessments. Most features are site based, or in the paddock. However, because the arrangement of habitat features across the landscape is also important for biodiversity, some landscape scale features have also been selected as key features.

1. SITE SCALE FEATURES

LARGE, OLD TREES

Mature trees are one of the most important features in productive and biodiverse grazing lands, both in the paddock and in retained woodland patches. Large, living trees provide more leaf material for leaf-eaters such as koalas, more nectar for nectar-feeders such as honeyeaters, more surface area for trunk foragers such as sugar gliders, and more shelter opportunities for hollow-dwellers such as cockatoos and crevice-dwellers such as geckos.

Large trees with hollows are special features in the landscape, because they take a long time to develop and provide essential habitat for many species. In southwest Queensland a eucalypt tree can take over 100 years to develop hollows. Non-eucalypt trees such as mulga and brigalow do not readily form hollows, but do form deep crevices and cracks that are used by fauna. In these trees, it can take up to 60 years for them to become big enough to develop useful crevices.

A LARGE, OLD POPLAR BOX

Large poplar box trees provide increased water infiltration and deep nutrient cycling, which brings nutrients to the surface that are accessed by productive, perennial grasses, particularly during dry times.



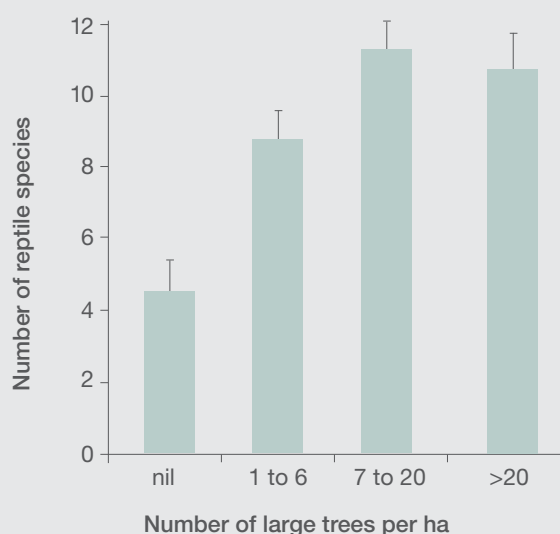
“ This large old tree also contains hollows, essential for hollow-nesting species such as the little pied bat and Major Mitchell cockatoos. ”



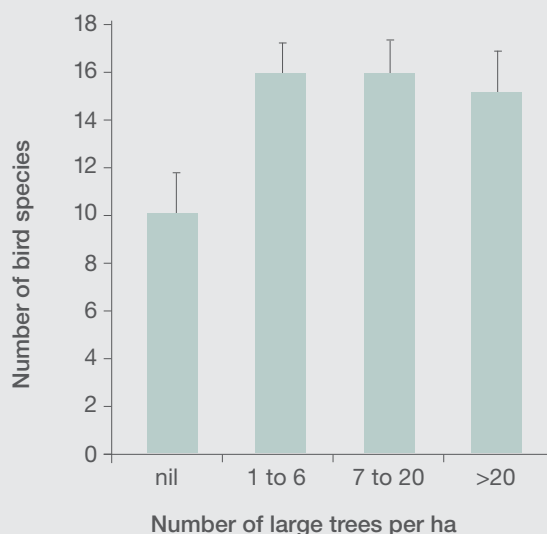
PADDOCKS WITH LARGE TREES SUPPORT MORE SPECIES

In the paddock, retaining as little as one to six large trees per hectare will significantly increase the habitat value for reptile and bird species.

REPTILES



BIRDS



The velvet geckos (*Oedura* species) of southwest Queensland live on tree trunks in narrow crevices and behind bark. They are very dependent on large, mature trees because these provide shelter.

The treecreepers (*Climacteris* species) of southwest Queensland forage on insects that live in fissures and under bark of large trees. Treecreepers also rely on large trees to provide hollows for nesting and shelter.



Oedura monilis



Oedura robusta



WHITE-BROWED
TREECREEPER



BROWN
TREECREEPER

Photos: Graeme Chapman

SHRUBS

Gliding mammals such as feathertail, sugar and squirrel gliders, small woodland bird species such as inland and chestnut-rumped thornbills and rufous whistlers, and reptiles such as spiny-tailed geckos specialise in gleaning insects, nectar or gums from a variety of shrubby plants.

Shrubs also provide perfect feeding look-out stations for little ground foraging birds such as red-capped robins, and at the same time providing protection from larger, aggressive species and predators. Legless lizards also tend to shelter in litter under shade-providing shrubs.

“The eastern spiny-tailed gecko hunts for insects in shrubs.”



In some land types however, an overabundance of shrubs is undesirable, for both grazing land production and wildlife. For example, in soft mulga land types, increased densities of shrubs (mostly *Eremophila* species) successfully compete with grasses for limited resources such as moisture, nutrients and space. This leads to lower grass cover and diversity, and overall, less ground cover habitat complexity. In the Mulga Lands, a high shrub density coincides with lower diversity of ground foraging birds and terrestrial reptiles. This is because there is less access to open ground area for birds to search for food, or for reptiles to bask.

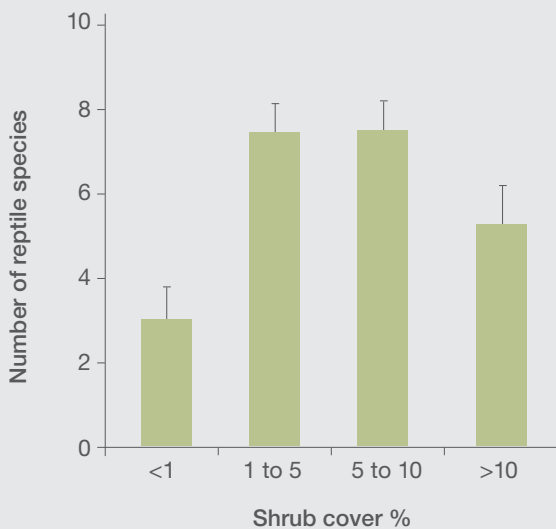


From top left; the sugar glider relies on shrubs (particularly *Acacia* gum) for food; the red-capped robin uses shrubs for protection against predatory and aggressive birds; and the brigalow scaly-foot shelters in litter under shrubs.

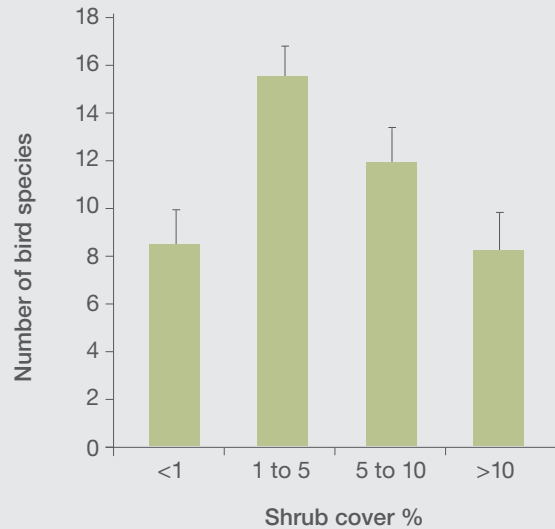
SOME SHRUB COVER IS A GOOD THING

In pastures, maintaining between 1 to 10% shrub cover means you can almost double the number of reptile and bird species.

REPTILES



BIRDS



BRIGALOW BELAH SCRUB



This pasture has 0% shrub cover, and supports 5 bird species.



This pasture has 2% shrub cover, and supports 17 bird species

SOFT MULGA



This pasture has 31% shrub cover, and supports 6 bird species



This pasture has 1.5% shrub cover, and supports 22 bird species

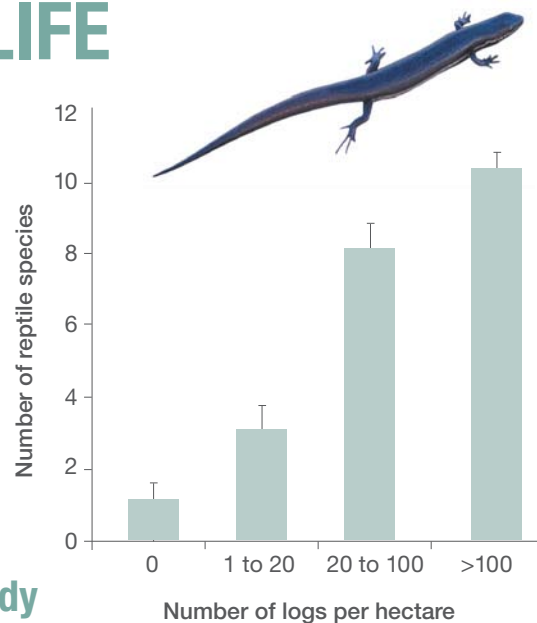
WOODY DEBRIS

Woody debris such as logs and branches provide important habitat for many species of plants and animals and play a key role in recycling nutrients and protecting soils. Logs can provide sites for seedling establishment, and offer shelter and a place to forage for many species of vertebrates (small mammals, reptiles and birds). Logs are important hunting grounds for insect-eating birds such as hooded and red-capped robins, tree creepers and willie wagtails.

Reptiles love logs and in addition to using them as basking sites, they live and feed in or under them. Logs also provide a rich substrate for insects, fungi and microorganisms (Nature's recycling wood eaters), which in turn provide a rich source of food for many insect and fungus eaters. Animals use woody debris at different stages in its decay cycle. Decayed wood can provide stable temperatures and moisture in which to nest and shelter, whereas less decayed wood with peeling bark still attached provides shelter and protection for species of geckos (such as the velvet geckos, *Oedura* species), skinks (like the tree skink, *Egernia striolata*) and snakes (better than near your house!).

Logs can be retained in remnant vegetation and in pastures by minimising fire and keeping log piles when clearing for dams and roads. Even a small amount retained in paddocks provides vital habitat for many species but also acts as sinks where nutrients can accumulate and soil and plant growth is supported.

MORE LOGS MORE LIFE



“ Many species of reptiles rely on woody debris for a place to live, and it appears the greater the amount, the more species. ”

A PLACE TO CALL HOME

THE EASTERN ROCK-SKINK (*Liopholis modesta*) AND THE YAKKA SKINK (*Egernia rugosa*)

These robust skinks are rarely seen and rely on woody material for sheltering and breeding sites, are known to build burrow systems under logs, and often live in small family groups.

They are omnivorous (eat both plant and animal material) and opportunistic (they will basically eat anything that walks past their mouths, as long as it's not too fast!) and feed on large volumes of arthropods (spiders, insects (particularly beetles), millipedes and centipedes), small vertebrates, soft plant material and fruits. Keep an eye out for these guys around piles of logs.



“These robust skinks are rarely seen and rely on woody material for sheltering and breeding sites”

'GOLD' SITE

In what appeared to be a fairly simple paddock site with few key habitat features, scientists found an unusually high diversity of reptiles. Despite the absence of many of the other key features, the site distinguished itself from nearby paddocks by having some good sized logs. All of the reptiles were found living in or under the logs, which provided essential habitat for the reptiles to shelter and forage in. The site was affectionately then known as 'gold' site. And it was all thanks to the logs.



BLUE-TONGUE
LIZARD



BROAD-BANDED
SAND-SWIMMER



BOULENGER'S
SKINK



BYNOE'S GECKO



STEPHEN'S
BANDED SNAKE



YAKKA SKINK



EASTERN ROCK-
SKINK



LIVELY RAINBOW
SKINK



YELLOW-SPOTTED
MONITOR



YELLOW-FACED
WHIPSNAKE



EASTERN MULCH
SLIDER

“MORE LOGS =
MORE LIFE!”

NATIVE PERENNIAL GRASS

A dense cover of perennial grasses dominated by 3P (perennial, productive and palatable) species is a key feature of the *EDGE*network Grazing Land Condition (ABCD) framework. The good news is that ensuring a rich and dense cover of native perennial grasses has many advantages for biodiversity too, as grass tussocks provide valuable sheltering and foraging resources for many species.

Pastures of perennial native grass provide:

- Food for seed eating (granivorous) birds – eg finches, pigeons and doves, and the grass itself provides food and a place to forage for many species of smaller marsupials such as dunnarts, bettongs and potoroos.
- Large tussocks provide shelter and nesting sites – many species utilise tussocks for shelter, eg bettongs, skinks and legless lizards shelter at the base of tussocks. Other species such as the little button-quail and squatter pigeons use tussocks for nesting sites.

DIVERSITY IN NATIVE PERENNIAL GRASSES USUALLY MEANS:

- A continual supply of seeds for granivores, and replenishment of grass seed stocks.
- Diversity in other ground plant species as well. Annual grasses and other herbage are important components for cattle health.
- A resilient pasture, which is less susceptible to insect attack and disease.
- Greater plant and animal biodiversity.



WHY NATIVE?

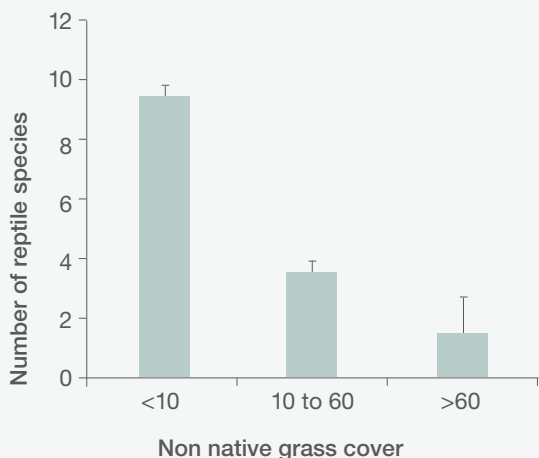
Although grass cover, of any type, is valuable habitat and essential for soil protection, there are some disadvantages of pastures dominated by non-native, introduced (exotic) pasture species for biodiversity. This is where condition for biodiversity, and condition for grazing land management diverges, as pastures dominated by exotic grass species is usually seen as good for stock grazing, but is usually not good for biodiversity.

SOME DISADVANTAGES OF EXOTIC PASTURES:

- Exotic pastures have less diversity, making them less resilient. Having a diverse pasture of native species provides a more even availability of yield, as different species peak and decline over the course of a year.
- Some exotic pasture species tend to dominate areas, leading to the exclusion of native grass and forb species.
- Some exotic species have a tendency to ‘escape’ into non-target areas such as remnant vegetation patches, resulting in changes to the ecology of those areas. Areas dominated by exotic pasture species tend to be susceptible to more intense fires, due to the density at which they grow, leading to a reduction in the availability of other features known to be important for biodiversity such as woody debris and shrubs.

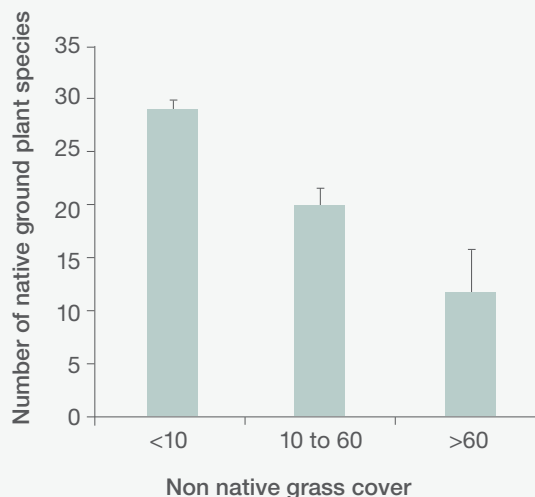
LESS NATIVE GRASS COVER, LESS LIZARDS!

Lizards provide valuable ecosystem services that help maintain the health of paddocks. For example, skinks and legless lizards help to aerate and mix soils and the burrows they create are important for nutrient flow and water infiltration. Pastures dominated by exotic grass species result in a reduction in the number of reptile species in the paddock.



MORE DIVERSITY, MORE RESILIENCE!

Monocultures are susceptible to disease and insect attack and are therefore never ideal. Having pastures with a variety of species is not only good for cattle health, but it has the added advantage of increasing biodiversity in the form of plant species richness in the ground layer, leading to flow on effects for all other animal species. Diverse pastures therefore provide a win-win for biodiversity and production.

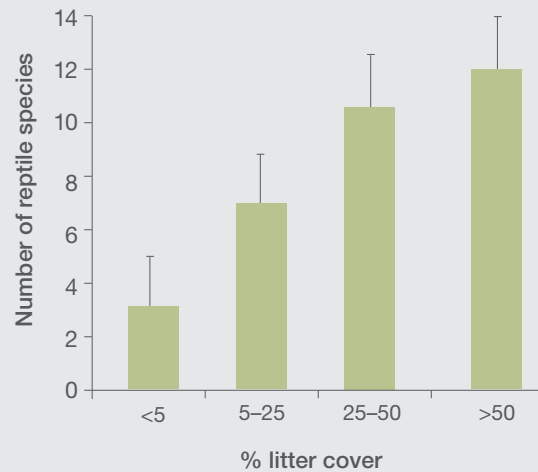


LITTER COVER

Litter is a very valuable nutrient source for shallow rooted forbs and grasses, as well as providing shelter, nesting sites and foraging resources for a myriad of animal species.

Invertebrates (insects, spiders and beetles) are abundant in leaf litter and provide many reptiles, birds and small mammals with an important food source. Some reptiles such as legless lizards, fossorial skinks (adapted to live in the soil-litter), geckos, dragons and blind snakes rely on litter not only for shelter and foraging but also as places to lay their eggs. The litter retains moisture, keeps soil friable to allow burrowing and provides a more constant environment to allow reptile eggs to be deposited and incubate.

SMALL CRITTERS LOVE LITTER!



Other species (bird, reptile and mammal) take advantage of all the tasty invertebrates found living in the litter, such as the small mammal here, Gile's planigale. Litter is also very useful for nesting in, particularly for ground dwelling birds like quails.



SOIL

Soil condition is a key feature of Grazing Land Condition ('ABCD' framework), and refers to the capacity of the soil to:

- Absorb and store rainfall.
- Store and cycle nutrients.
- Provide habitat for seed germination and plant growth.
- Resist erosion.

Soil is habitat for a number of species of micro-organism, which are crucial to healthy functioning of the soil. In fact, soil microbes increase the transfer of nitrogen from litter to the soil by 50%!

**KEEPING LITTER = KEEPING MICROBES
= KEEPING SOIL NUTRIENTS = KEEPING
GRASS, WHICH PROVIDES MORE LITTER!**

Soil is also habitat for *soil ecosystem* engineers. Soil ecosystem engineers are those large soil fauna that influence the development and maintenance of soil structure, and include large invertebrates (termites and earthworms), frogs such as the ornate burrowing frog, reptiles such as *Lerista* species (many species!) and coral snakes, and mammals (eg bilbies that burrow, and dunnarts that use cracks).

SOIL ECOSYSTEM ENGINEERS: IMPROVING THE CONDITION OF THE SOIL.

From left, the legless lizards *Lerista punctatovittata* and *Lerista fragilis* in hand, the coral snake and echidna.



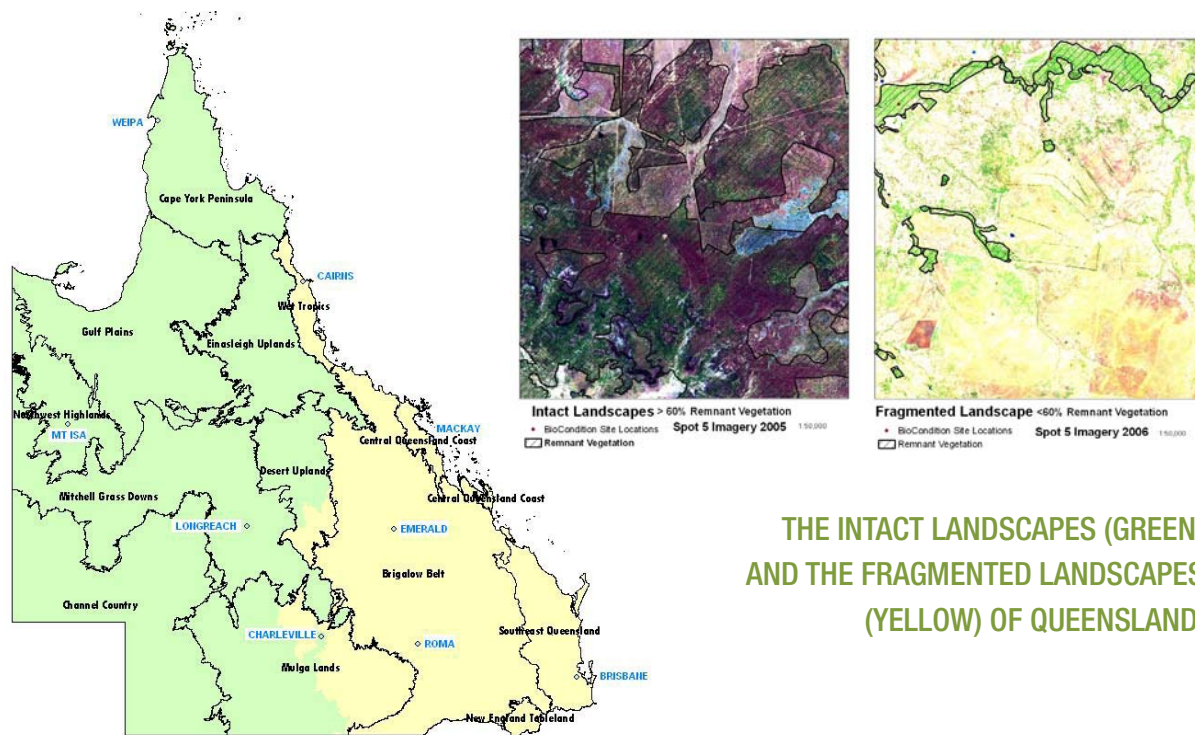
In turn... these 'ecosystem engineers' contribute to the development of soil quality through soil turnover and formation, litter capture and promotion of healthy soil chemical and physical properties, especially in drier areas where there is less available water to circulate properties through the soil.

Animal foraging pits in soil, such as those made by echidna and bettongs, provide an important mechanism for trapping soil organic matter transported by wind or water. This is particularly important during drought or overgrazing when natural sinks such as grass tussocks are limited.

2. LANDSCAPE SCALE FEATURES

The landscape around a site has a significant influence on the long-term viability of the site for biodiversity. In Queensland, variation in landscape features can be seen in *fragmented* landscapes, which have sharp boundaries (eg native vegetation next to a pastureland). Variation also occurs across *intact* landscapes, where the boundaries are less sharp and more like gradients of habitat quality (eg increased total grazing pressure with distance from water points).

Fragmented landscapes are those landscapes in higher rainfall regions of eastern Queensland where around 40% of the original vegetation remains. Intact landscapes are usually known as the rangelands, and clearing has been minimal.

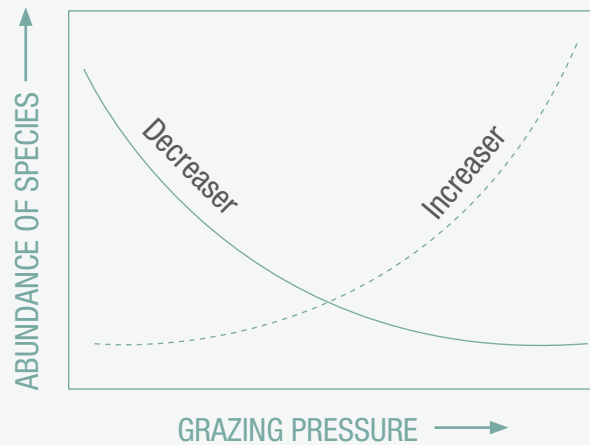


INTACT LANDSCAPES

In intact pastoral landscapes, there are subtle mosaics of variation in grazing pressure in response to distance from waterpoints. From a waterpoint, cattle can travel up to 6km, sheep up to 3km and red kangaroos around 7km. Areas greater than 6km from water are usually only very lightly grazed.

WATER POINTS, AND GRAZING INCREASERS AND DECREASER SPECIES

Some species, the increasers, become more abundant closer to waterpoints where grazing pressure is higher. Other species, the decreasers, lose out with increased densities of waterpoints.



GRAZING INCREASERS:

- Are tolerant to disturbance.
- Prefer lots of bare ground.
- Feed on seeds of weedy forbs and grasses.

GRAZING DECREASERS:

- Have a low tolerance to disturbance.
- Need good ground cover of litter and grasses.
- Feed on perennial grass seeds.

SOUTHERN QUEENSLAND INCREASERS:



CRESTED
PIGEON



NOISY
MINER



RUFOUS
WHISTLER



SPINY-TAILED
GECKOS



MULGA NETTLE – A
NATIVE ANNUAL FORB



PIGWEED – AN
INTRODUCED FORB



KANGAROO
GRASS



CHESTNUT-RUMPED
THORNBILL

Bird Photos: Graeme Chapman

Not only do areas remote from water provide refuge for species sensitive to grazing pressure, but they also provide refuge from feral predators and aggressive native species that need to be close to water. This exerts another pressure on sensitive species.

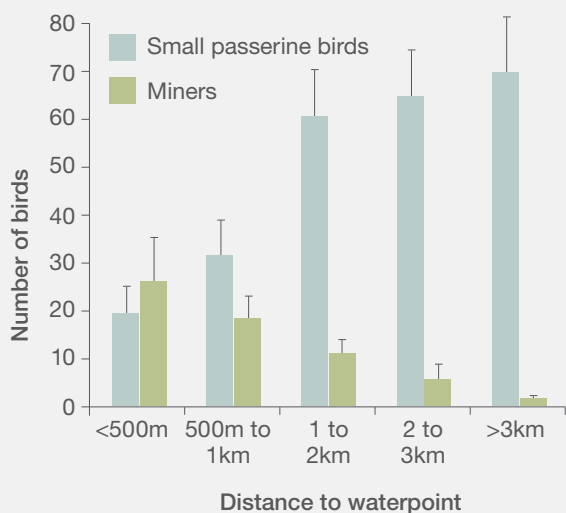
MINERS AND THE SMALL PASSERINES

Noisy miners and yellow-throated miners are large, native honeyeaters that live in groups. Each group is very territorial, and miners are very keen on defence. This means they tend to aggressively exclude most small birds from their territories.

Small passerines are ‘perching’ birds whose head to tail length is smaller than 25cm. A number of species of small passerine are known to be declining in many parts of Australia. These small birds tend to be the object of the miner’s bullying behaviour.



NOISY MINER SHARES WATER WITH CATTLE



Miners need to be closer to water than small passerine species. They also cope very well in highly grazed habitat. Consequently, we see that closer to waterpoints there are increased numbers of miners. However, small passerine species increase in numbers the further away from waterpoints. This may be partially an effect of lighter grazing, but even more so is the effect of reduced bullying from miners.

FRAGMENTED LANDSCAPES

Fragmented pastoral landscapes are mosaics of cleared land for pasture and patches of remnant and regrowth vegetation. In these landscapes, there are species that like to inhabit the edges between pastures and woodland remnant and/or regrowth (eg yellow-throated miners) and species that do well in cleared pastures (eg galahs, Richard's pipits and stripe-faced dunnarts). Then there are those species that exclusively depend upon remnant woodland for habitat; the woodland-dependent species. These species are locally extinct in highly cleared and fragmented landscapes. They respond not only to the *amount* of native woodland that remains, but also to the degree of *connectivity* between patches of woodland.

LANDSCAPE CONTEXT – The amount of remnant and/or high value regrowth native vegetation in the landscape.

LANDSCAPE CONNECTIVITY – The degree to which the landscape facilitates or impedes species movement among patches of native vegetation.

WOODLAND DEPENDENT SPECIES

These are species that only occur in woodland habitats, and are unable to cross gaps between isolated woodland habitat patches.

Most woodland dependent reptiles can be found in small (<5ha) patches as well as larger patches of remnant vegetation. This is because they have small territories, and don't move very far, as opposed to more mobile species such as large mammals and birds. However, we are not sure how viable their populations are in these smaller woodland patches and are continuing to question if these patches are large enough for the long term survival of these species.

WOODLAND REPTILES

The velvet geckos (top photo), tree skinks (middle photo) and wall skinks (bottom photo) are found mostly in woodland patches in southern Queensland.





Level 1, 165 Walker Street
North Sydney NSW 2060
Ph: +61 2 9463 9333
Fax: +61 2 9463 9393
www.mla.com.au