MANAGING NATURAL ASSETS ON FARMS:

Rocky outcrops

SUSTAINABLE FARMS

A variety of grasses, including native grasses, have quickly sprung up in this recently fenced rocky outcrop, on a sheep property in the Yass Valley, NSW.
Photo: Suzannah Macbeth

Rocky outcrops come in all shapes and sizes, ranging from huge granite boulders strewn across hilltops, to small collections of scattered rocks in a paddock. Areas of surface rock take millenia to form, yet have often been removed from agricultural landscapes.

The rocky areas that remain on farms are now especially valuable as habitat for a range of plants and animals, including threatened and specialised rock-dwelling species. Farmers have a real opportunity to provide stewardship of these unique habitats.

When protected from grazing and revegetated with groundcovers and low shrubs, rocky outcrops can help filter and slow runoff, leading to increased soil moisture and reduced erosion.

Supporting healthy farm ecosystems

- Healthy rocky outcrops can boost farm biodiversity, productivity and soil health.
- Managing rocky outcrops generally requires little ongoing effort, cost or impact on agricultural production.
- Rocks are an irreplaceable, finite resource that provide essential habitat for a range of native plants and animals.
- Many of these plants and animals are threatened, while others provide important ecosystem services such as pest control, erosion control and pollination.
- The cracks and crevices among rocky outcrops protect vulnerable plants from grazing by livestock and other herbivores, meaning that many plants that were formerly widespread now find refuge among the rocks.

Why enhance rocky outcrops?

Improving rocky outcrops has multiple benefits—for farm productivity and soil health, and for native plants and animals. An intact rocky outcrop that is protected from overgrazing and is well vegetated, with good groundcover around the outcrop, can:

- Retain moisture through moss beds and sub-surface seepage, releasing water back into the landscape slowly through springs and soaks.
- Help filter and slow runoff, leading to increased moisture retention in soils and reduced erosion, thereby leading to improved water quality in dams and creeks.
- Support a diverse range of plants and animals that in turn provide ecosystem services such as crop pollination, water and nutrient cycling, and pest control.

An eastern stone gecko *(Diplodactylus vittatus)*, one of many reptiles living among rocky outcrops. Photo: Dave Smith.

Connecting natural assets for multiple benefits

Linking protected rocky outcrops with vegetation and other natural assets—such as shelterbelts, dams, riparian areas and scattered paddock trees—across the landscape is a great way to improve ecosystem services on your property. When linked, the value of these areas for production and biodiversity is magnified and is greater than the sum of parts of individual assets.

Not all animals use trees to move through the landscape; some use rocky outcrops, scrub, grasslands, logs and leaf litter. When choosing which rocky outcrops to protect, consider how your farm is placed within the surrounding landscape. For example, you may be able to link a rocky outcrop on your farm with remnant vegetation and established trees along the roadside by planting some midstorey shrubs. This enables species to move through the landscape, and extends and enriches wildlife habitat.

Morgan's Lookout, a prominent rocky outcrop in southern NSW. Stock are excluded from the outcrop, which is well-vegetated. Photo: Damian Michael.

Supporting biodiversity

Rocky outcrops can be incredibly rich in native animals and plants, and the removal of rocks and boulders over the decades means these habitats are now rare and precious.

More than 180 native Australian animal species are dependent on rocky outcrops to survive and more than 50 of these are threatened with extinction.[1,2]

Protecting and enhancing rocky outcrops can:

- Secure critical habitat for threatened native reptiles that rely on rocky outcrops, such as the striped legless lizard *(Delma impar)* and the pink-tailed worm lizard *(Aprasia parapulchella).*
- Provide shelter and breeding sites for butterflies, moths and their predators.
- Provide specialised habitats, such as rock crevices, sheets, overhangs and caves. Fairy martins build their bottle-shaped mud nests under overhangs, Cunningham's skinks shelter in rock cracks and crevices and thick-tailed geckos shelter under sheets and slabs of rock. Many microbats roost in rocky outcrops, and can eat several hundred insects per hour.[3]
- Provide refuges for rare and threatened plants, many of which were once widespread but now only survive among rocks, sheltered from grazing.
- Create stepping stones for native animals to move across both the farm and the broader landscape. Since they often exist on hilltops, rocky outcrops can help fill the gaps left between other natural assets lower in the landscape, such as roadside corridors, creeklines and shelterbelts.

How to protect and enhance rocky outcrops

Planning for connectivity

- Mapping outcrops and assessing vegetation and soil condition as part of a farm plan is a good first step towards choosing how to manage and use the rocky areas on a farm.
- Where possible, plan to connect protected rocky outcrops to other natural assets such as shelterbelts, riparian areas, paddock trees, patches of vegetation, roadside corridors and/or dams extend and enrich the available habitat.
- Large outcrops usually support more individual animals than small patches, but even small outcrops provide valuable habitat.

Fence and protect

- Exclude or limit livestock access. This allows the trees, groundcovers, grasses and other plants to flourish; providing habitat and stabilising soil.
- Limit hazard reduction burning near outcrops as it can damage rock features and destroy habitats.
- Prevent bush-rock or firewood collection. Rocks are an irreplaceable and finite habitat resource for plants and animals. Leave fallen timber as it provides microhabitats, which in turn support a greater diversity of species.
- Support pollinators and other species by avoiding spray drift.

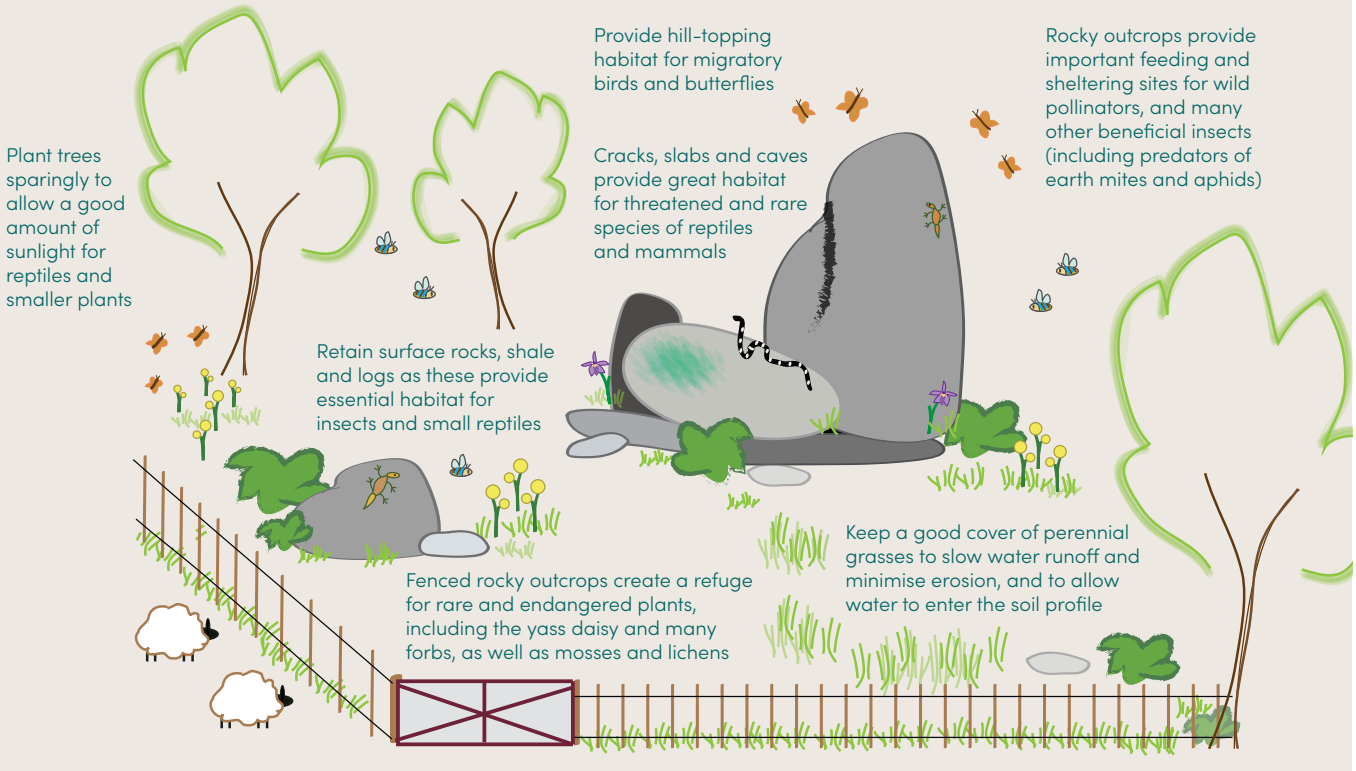
Revegetate

- Water flows quickly off rocky areas, so good ground cover is essential for minimising erosion and increasing moisture infiltration into the soil.
- Vegetation usually regrows when grazing is limited, but planting may be needed to re-establish native groundcover on heavily eroded or degraded outcrops.
- However, don't plant many trees or dense shrubs—shade removes basking sites for reptiles and will dramatically reduce the outcrop's habitat value. Grasses and forbs also require plenty of light.
- Use locally native plants—they have the best chance of long-term survival, benefit native wildlife and help restock the soil seed bank.
- A rocky outcrop is a great place to try re-establishing the native forb layer, and can become a valuable source of resources for pollinators. See Powerful Pollinators for planting guidance.[4]

Manage pests

- Monitor and control exotic and native weeds and pest animals such as rabbits, goats and foxes.
- Avoid ripping rabbit warrens during summer, as Murray Darling carpet pythons—which are excellent pest controllers—often use warrens for shelter during warmer months.

Key features of a protected rocky outcrop



Hilltopping butterflies

Butterflies often gather at the top of rocky outcrops in search of mates during the breeding season, especially males searching the summit for females—a behaviour called hilltopping.

Eliminating or disturbing the vegetation on rocky outcrops can affect the survival of hilltopping butterflies. Some of the butterfly species that hilltop include dainty swallowtails, montane ochre, barred skipper, yellow grass-skipper, fringed heath-blue, spotted jezebel, varied dusky-blue, marbled xenica, painted lady and common brown butterflies.

Some species are obligate hilltoppers—they return year after year to the same rocky outcrop to breed. Examples include skippers (Family Hesperiidae), swallowtails (Family Papilionidae) and gossamer-winged butterflies (Family Lycaenidae).

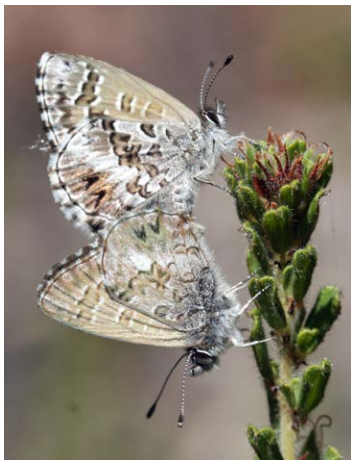
For these butterfliers, their reproduction and long-term survival depends on access to particular hilltops.[5]

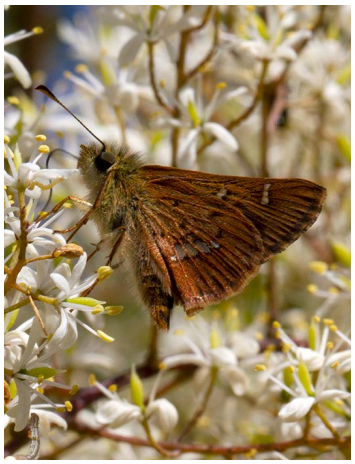
Living pest control

Prior to modern forms of pest control, landholders once relied on Murray Darling carpet pythons *(Morelia spilota metcalfei)* to control pests like rats and mice around sheds and grain silos. But like many Australian species, python numbers have declined since the 1800s in many parts of Australia—they are now listed as endangered and are rarely seen.

Murray Darling carpet pythons are spectacularly patterned with slate grey, dark blue and black patterns all over their bodies. They are non-venomous and kill their prey, mostly the introduced house mouse, black rat and European rabbit, by constriction.[6] The main threats to their survival are habitat loss and being killed by foxes, feral cats and people.

Rocky outcrops are great habitat for Murray Darling carpet pythons, and by protecting these areas and, where possible, connecting them to vegetated areas along creeks or in valleys, farmers can help create the conditions for the species to thrive and once again play a role in pest control.





Two species of hilltopping butterflies. At left, a pair of fringed heath-blue *(Neolucia agricola)* in mating season, and centre, a barred skipper *(Dispar compacta)*. Photos: Michael Jefferies.

Carpet python *(Morelia spilota)*.
Photo: Damian Michael.

Notes and references

[1] Species that have been assessed as at risk of extinction in the foreseeable future are listed under the EPBC Act 1999 as either Critically Endangered, Endangered, Vulnerable or Conservation Dependent.

[2] Michael D and Lindenmayer D (2018) *Rocky Outcrops in Australia.* CSIRO Publishing, Melbourne.

[3] FNPW, *Microbat.* URL: www.backyardbuddies.org.au/fact-sheets/microbat. Accessed 14 October 2020.

[4] For more information on planting for pollinators, see Sustainable Farms (2020) *Powerful Pollinators: Encouraging insect pollinators in farm landscapes.* Available at www.sustainablefarms.org.au/info/pollinators

[5] Michael D and Lindenmayer D (2018) *Rocky Outcrops in Australia.* CSIRO Publishing, Melbourne.

[6] Lindenmayer D *et al.* (2022) *Natural Asset Farming.* CSIRO Publishing, Melbourne.

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