The Environmental Case for a 'Reserve for Travelling Stock and Biodiversity'

The Environmental Case for Converting Stock Routes into a 'Reserve for Travelling Stock and Biodiversity' under Climate Change.

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Vision

An entire network of biodiversity corridors linking patches of healthy remnant vegetation from north-to-south and east-to-west across Queensland and NSW. Such a network will provide mobility and refugia for native species under current and future climates as well as grazing options for travelling stock during droughts and with higher fuel costs caused by peak oil and carbon trading.

Objectives

To provide biodiversity corridors along environmental gradients through which species of native plants and animals can disperse across eastern Australia, especially during extreme weather events and under climate change. This will serve the same purpose for the arid ecosystems in the Outback west of the Great Dividing Range (GDR) as the montane corridor of the Alps to Atherton project is intended to do for the forests. Revision of Qld and NSW government policies on management of their stock route networks must take risks to biodiversity from climate change into account.

To provide healthy native vegetation in stock routes to support travelling stock when peak oil and carbon trading make road and rail transport much more expensive.

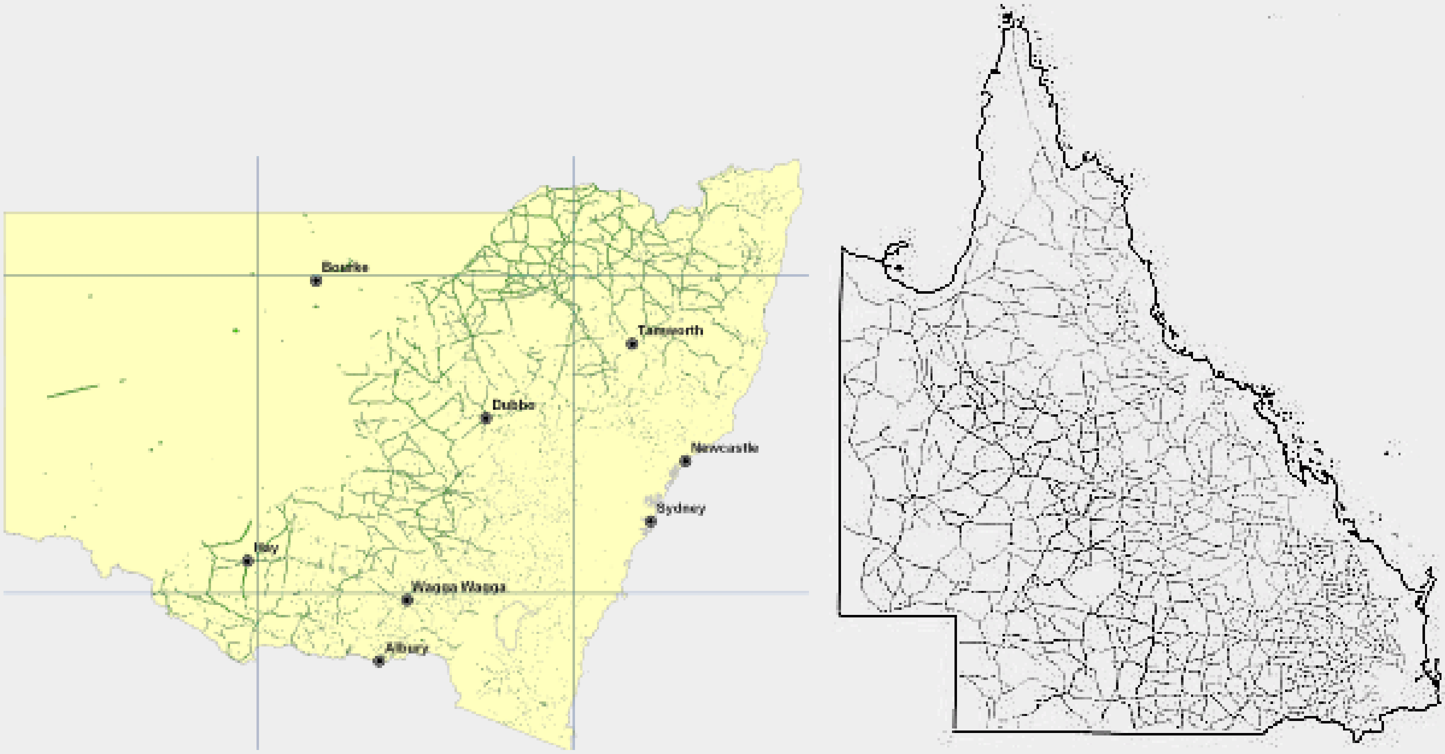

Fig 1 The Travelling Stock Routes in NSW and the Declared Stock Routes of Queensland showing their potential as corridors for species movements with climate change. Road reserves provide vast additional corridors with dense coverage along the coast

Principles

The Travelling Stock Route Network (TSR) in NSW and the Stock Route Network (SRN) in Queensland (the Networks), have multiple purposes that benefit society, the environment and the economy (Fig 1). Future environmental and economic changes will increase the community values of the stock routes as resources for adaptation to climate change, fossil fuel shocks and depopulation of inland Australia.

Irreversible changes to the stock routes should be avoided. Their management should facilitate adaptation by native species to climate change, with degraded and inactive sections being rehabilitated as biodiversity corridors. It should concurrently provide for future increases in their use by drovers in response to an imminent threat to road and rail transport of stock from soaring oil prices brought on by peak oil and the carbon trade.

A whole-of-government approach is needed to management of the Networks to accommodate the needs of multiple stakeholders

Key message

There is an urgent need to protect the physical integrity and environmental quality of the stock route networks in eastern Australia – from southern NSW to northern Queensland, and from the Great Dividing Range to the remote Outback - as a resource for biodiversity to adapt to extreme seasons and to climate change, and for the pastoral industries to adapt to soaring fuel costs

Background

The environmental values associated with the stock routes and associated activities have been documented **in the Queensland Stock Route Network Management Strategy 2006-09:**

The relevant roads and reserves that make up the stock route network represent a range of natural resources embodying cultural heritage, recreational, environmental, biodiversity and economic values (at page 4, par 2).

• Corridors of land to transport goods and services to and from rural communities have economic values associated with the high pastoral productivity of the land to meet the needs of travelling stock.

• The rich biodiversity, riparian areas and aesthetics, as well as value as a corridor linking areas of natural vegetation which allows for wildlife movement across the landscape have environmental values.

Similarly, environmental benefits to the community were listed by the AEC Group Report Table E.3:

1. Transport/Wildlife corridors providing a series of linkages between different areas and habitats.
2. Biodiversity conservation facilitates the biodiversity of species within the SRN.

3. SRN provides buffer zones along some high value habitat reducing the edge effects.

The benefits of the SRN for biodiversity can be summarized as follows:

1. Acts as corridors to facilitate seasonal movements by species with extreme seasons
2. Acts as corridors to facilitate progressive movements by species with climate change
3. Provides *refugia* for rare and endangered native species
4. Provides *refugia* for native species during extreme droughts
5. Provides a characteristic Australian landscape to attract inland tourists
6. Promotes ecotourism such as bird watching, photography and bush walking
7. Promotes recreational uses such as horse riding

Environmental values enhanced by the pressures of climate change

Climate is a primary determinant of the performance of species in the landscape. All species have characteristic climatic preferences that result in them having different success rates in different regions of Australia. Thus we see species with different geographical distributions that are often directly determined by climate. Under climate change their performance is expected to change depending on the location and the species concerned. Some species will need to adapt (evolve) or move while other populations will find the climate advantageous in previously sub-optimal areas. Sufficient landscape connectivity with the required quality of native vegetation is required if this is to happen.

Adaptation of biodiversity to climate change is expected to be much more difficult than has occurred in the past for two reasons. Firstly, the rate of climate change is much faster than occurred in most past events. This makes it more difficult for species to track the changing environmental gradients (Fig 1a,b) that are determined by climate. Secondly, humans have fragmented the landscape, restricting opportunities for movements across native vegetation. As a result of these events, species need a great deal of human help to assist them to survive in the impending decades.

Changes in temperature

Climate change (Fig 2) is expected to result in global warming, with most warming in the Polar Regions and least warming in the tropics. In the past such climate change has caused shifts in the geographical distributions of species as they track their required climatic regimens. In well documented cases, even trees have migrated thousands of km across continents as they tracked changing temperatures. In Australia the temperature has risen about 0.9°C in the past century, and it is expected to reach at least 2°C within the lifetimes of the younger generation.

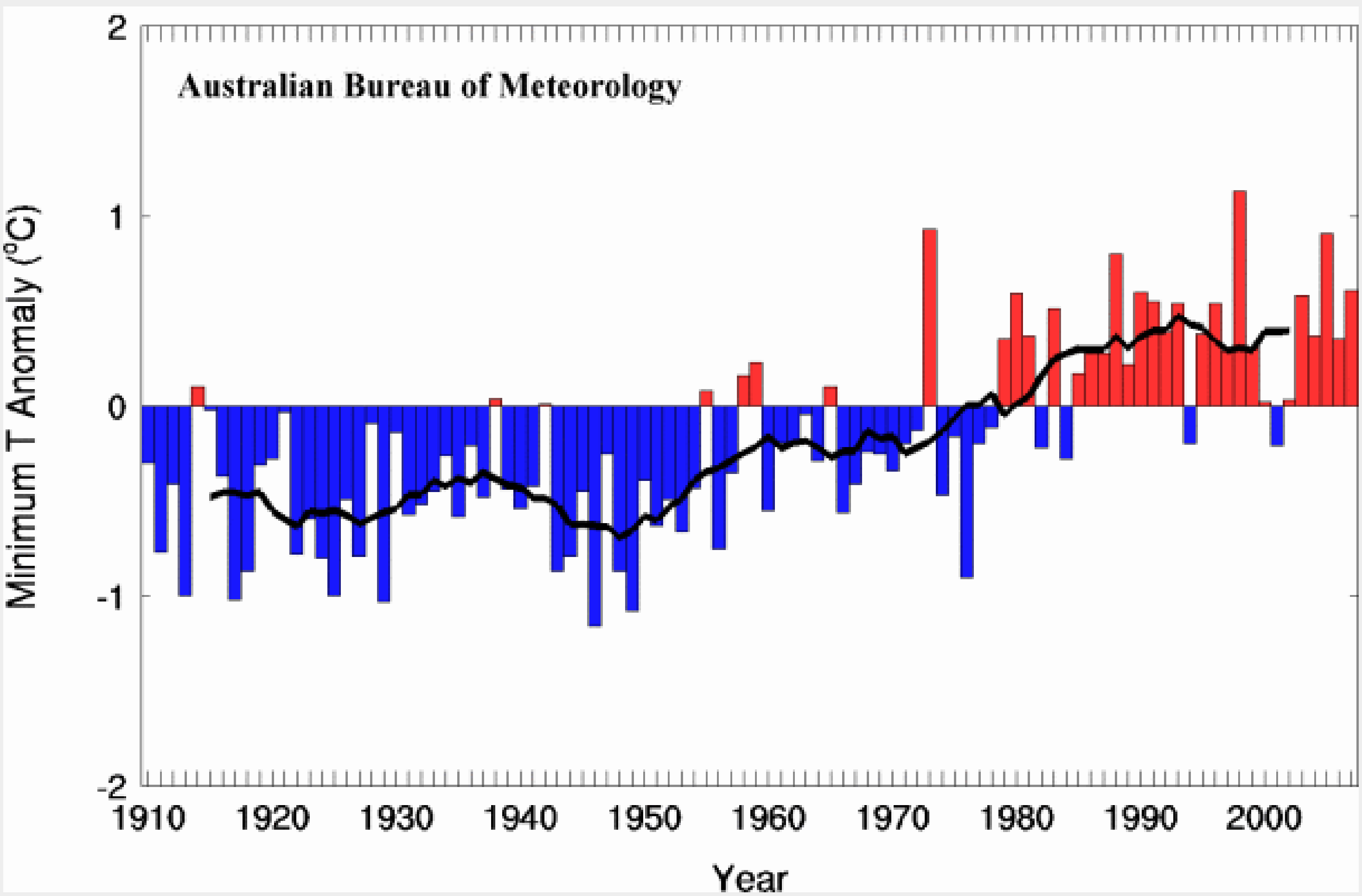

Fig 2 Annual minimum temperature anomalies (i.e. departure from long-term mean 1961-1990) for Australia.

In Australia, the productivity of species is likely to improve on the southern or high altitude margins of their distributions, which are currently limited by low temperatures (Fig 3). Higher growth rates result in more offspring becoming available each year to occupy adjoining vacant habitats. In the past this has enabled species to effectively ‘migrate’ across the landscape like a rolling cloud with an expanding front (Fig 4).

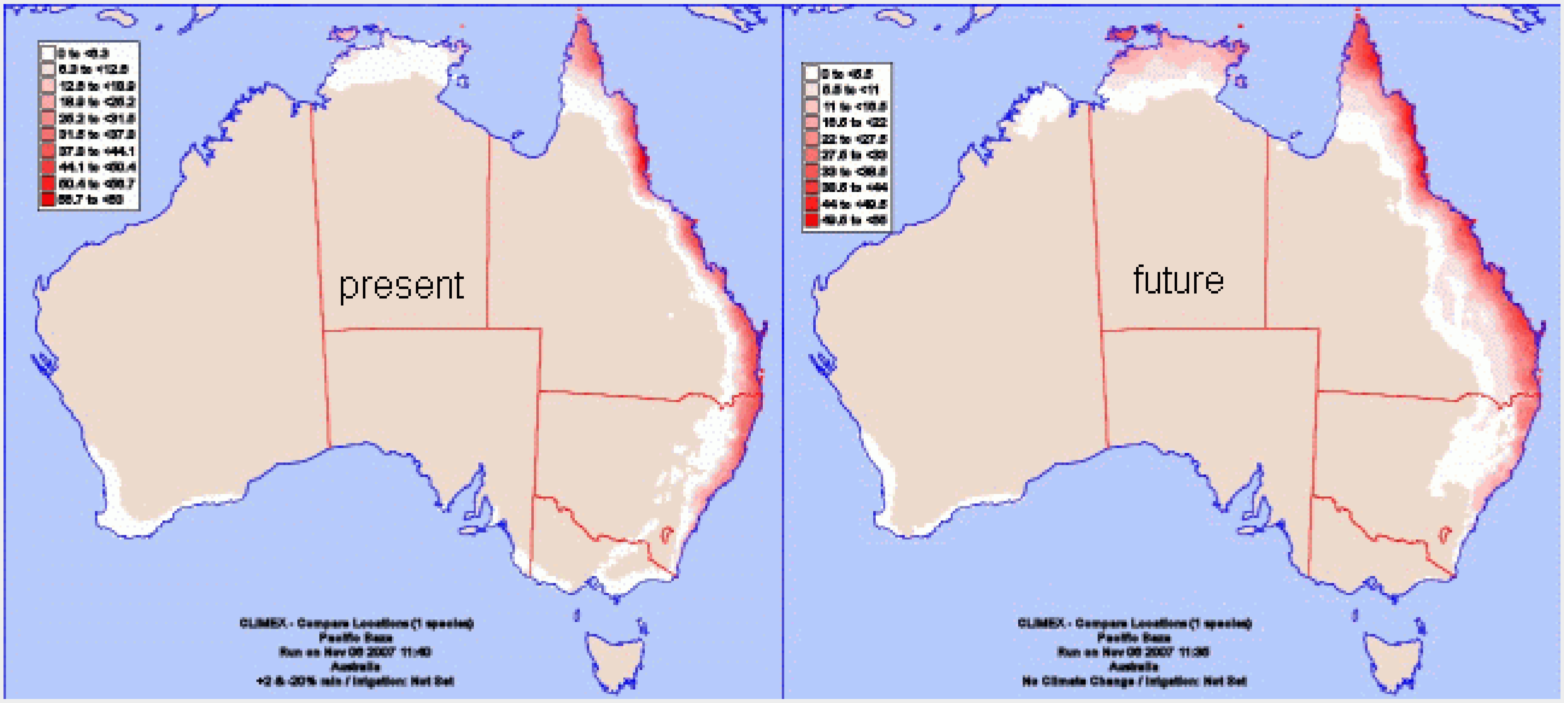

Fig 3. Modelling suggests that the Pacific Baza's range will expand in the south-east with a change of +2oC and –20% rain

Often this process takes centuries in the case of some trees for example, while in others it occurs in real time with almost immediate spread of some birds and weedy-type plant species. Counterbalancing this expansion there is likely to be a retracting rear in the north and at low altitudes as temperatures increase to exceed the suitable ranges of species (Fig 3). There is a vast literature on such changes already taking place around the world and involving numerous different types of organisms.

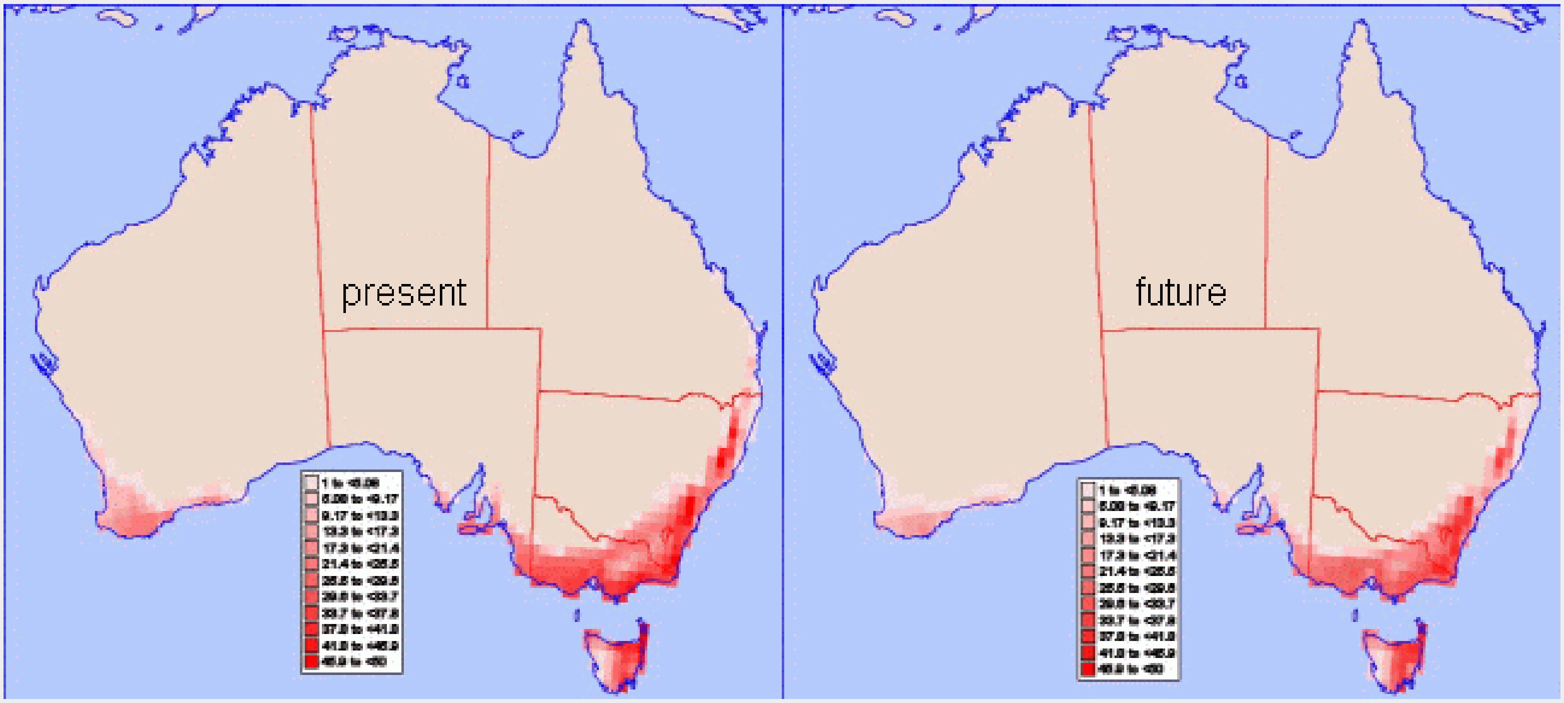

Fig 4. Modelling suggests that the Scarlet Robin's range will contract with a change of +2oC

In addition, temperature changes affect the seasonal patterns and lifecycles of plant populations and so affect the timing of flowering and fruiting of many species. This in turn affects the food supplies of nectar, seed, fruit and insects for birds. These effects are particularly important for migratory species that rely on precise timing of food supplies when they arrive at their breeding grounds. All of these changes track temperature and latitude / day-lengths so a continuous trend in the timing of food supplies along latitudinal gradients is vital. Adequate food supplies translate into successful breeding, so the stock routes provide one such latitudinal option for birds to maintain their breeding success as the environment warms.

As the environment heats up, there will be a need for species quickly to colonise the cooler southern regions and higher altitudes in order to occupy those climatic 'envelopes' in which they are able to persist (Fig 3). In order for them to respond effectively they need linked areas of their required habitat. The SRN & TSR provide the only such linkages in much of the bush west of the GDR.

Moisture

As the climate warms, rainfall patterns are expected to shift (Fig 5), both seasonally and geographically, as atmospheric pressure systems change. Higher temperatures also lead to an expectation of increased evaporation and transpiration but that may be offset to an extent by the greater amount of moisture in the atmosphere and by higher water-use efficiency of plants with enhanced concentrations of atmospheric CO_2. Higher temperatures with lower rainfall increase aridity and desertification. Higher temperatures with higher rainfall increase humidity and deliver glasshouse conditions.

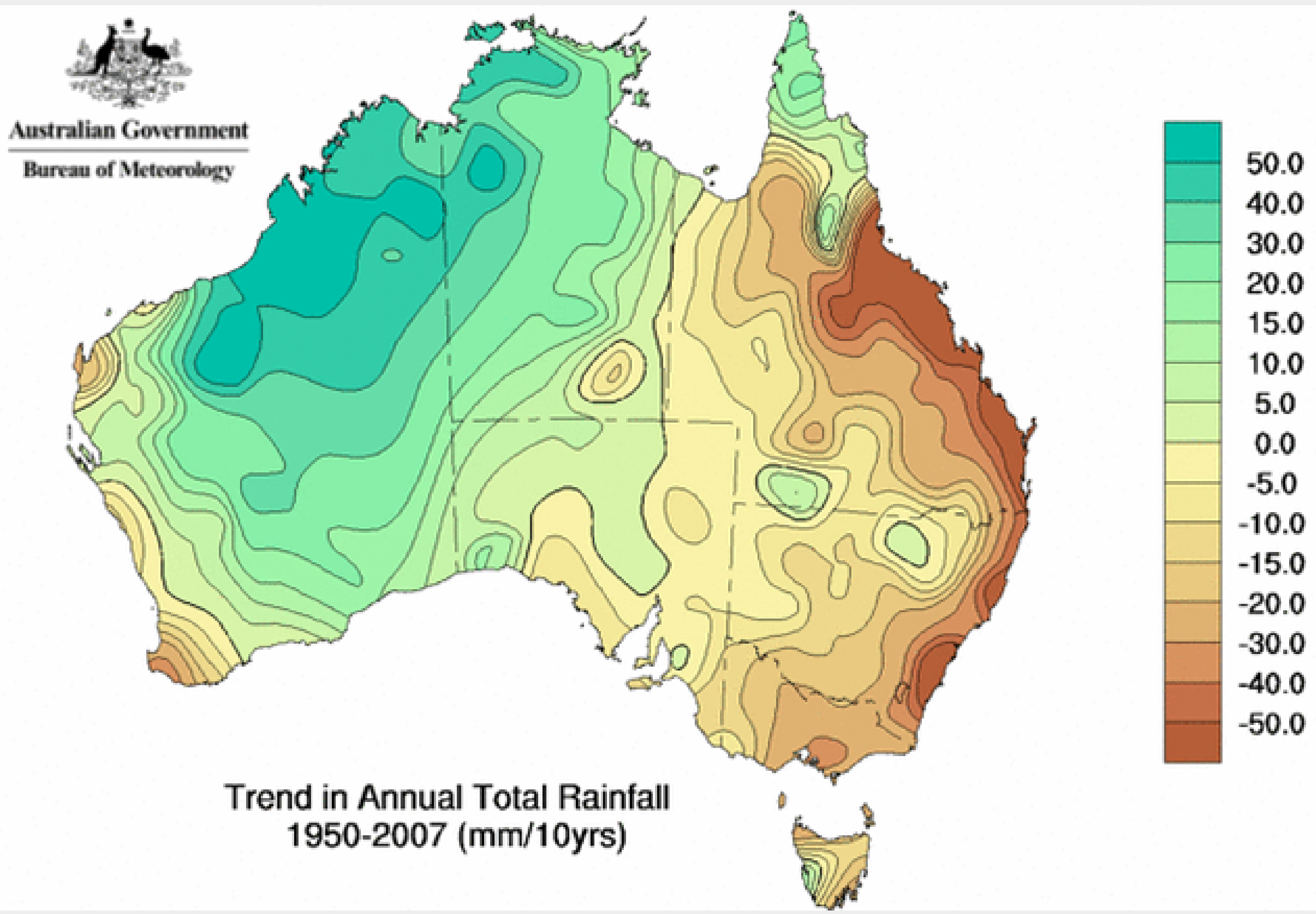

Fig 5. Changes (in mm) in total annual rainfall between 1950 and 2007 showing the drying trend in the east and south-west.

The most important changes are likely to involve an increased frequency of extreme climatic events like droughts and floods with what is referred to as the ‘intensification of the hydrological cycle’. These extreme events are very important in stressing species and pressuring them to adapt by migrating or risk local extinction. We already observe ‘abnormal’ seasonal movements of birds as many species, such as the black-eared cuckoo and yellow-throated miner, migrate towards the higher-rainfall, coastal areas during droughts, and water birds migrate to inland bodies of water in floods.

Climate change will therefore disrupt and intensify species movements as they attempt to track the changing moisture patterns in inland Australia. In order for them to respond quickly and effectively they need linked areas of native vegetation.

In addition, moisture changes affect the timing of seasonal flowering and fruiting of many plant species and so affects the supplies of nectar, seed, fruit and insects for birds. All of these changes track moisture gradients so a trend in the availability of food supplies is vital. As food supplies largely determine breeding patterns, the reproductive success of birds and insects depends on finding suitable food supplies as they travel across the landscape. The stock routes provide an option for movement outside the widely separated the riparian zones.

Landscape fragmentation

The difference between the current and past episodes of climate change is that humans have greatly fragmented the landscape (Fig 6) and so have disrupted many potential migration routes. Most native species are unable to survive in heavily grazed or cultivated land, so they must rely on so-called corridors between remnants of native vegetation to be able to adapt to climate change.

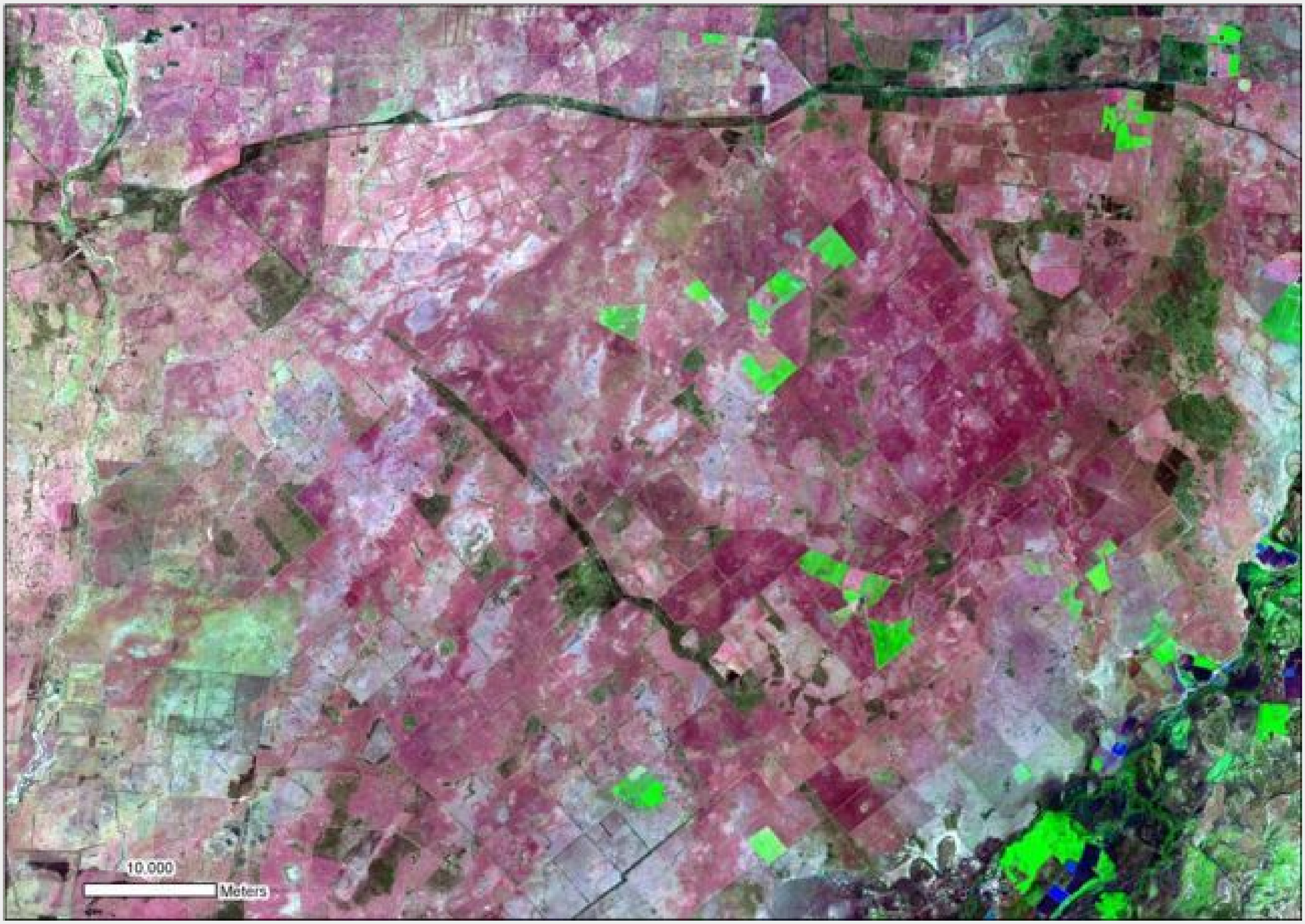

Fig 6. A satellite image of two stock routes (dark green) through a fragmented landscape of cropping country (pinks, bright green) in SW Queensland (D. Butler, EPA Qld)

On the east coast we have seen the development of the 'Alps to Atherton' forest corridor proposal; in Victoria there is the 'Biolink' project; and in Western Australia there is the 'Gondwana Link' proposal. Each of these proposals is designed to protect or restore connectivity across fragmented landscapes to help species adapt to annual changes in climate and future climate change. However, no such provision is being made west of the GDR where few options are available. One such option is to protect, restore and re-connect the existing stock route networks (Fig 6). This will provide the backbone of a corridor network linking patches of remnant vegetation on private properties and in protected areas like national parks (WildCountry).

The advantages of the SRN as a resource of adaptation of biodiversity to climate change.

Stock routes are continuous and they incorporate a full cross section of local landforms, vegetation types and watering points, whereas other types of reserves are discontinuous and tend to be targeted to a specific landform or vegetation type. Stock routes often contain fertile soils and sporadically grazed routes have much greater biodiversity than adjoining land that is continuously grazed or cropped.

In the context of climate change, road and rail reserves and stock routes form an extraordinarily fortuitous, extensive network of potential corridors, which could facilitate the movement of species in response to shifting climatic zones. The pattern of sporadic grazing has delivered the stock routes to the present generation in much better health than the adjoining areas. This is an interesting example of a reversal of the usual ‘tragedy of the commons’, in which shared land is usually overexploited.

The need for sporadic grazing

There is a consensus that continuous grazing reduces biodiversity in most environments. In a number of papers, Fensham demonstrated trends in species composition of grasslands with the intensity of grazing. Different groups of species thrived under light, moderate and heavy grazing along road-sides and in adjacent paddocks. Annual grasses and short annuals benefited from heavy grazing while perennial grasses and herbaceous shrubs required light or moderate and intermittent grazing.

The response of herbaceous vegetation to grazing varies between environments. The deep-rooted, perennial tussock grass, *Themeda triandra*, maintains inter-tussock spaces that provide niches for a variety of herbaceous species. The grass is sensitive to grazing and can be eliminated by moderate to heavy grazing, but dominates with no disturbance to the extent that it excludes the herbs.

Grazing also provides a disturbance regime that is necessary for a large component of the native flora. Other rare and endangered plants, such as *Discaria pubescens, Picris evae, Stemmacantha australis* and *Thesium australe*, may not survive even moderate grazing and will require ungrazed remnants on roadsides, rail reserves and private properties. In central Queensland the rare and endangered perennial herb, *Trioncinia retroflexa*, is restricted to spasmodically grazed stock routes, demonstrating that it is sensitive to continuous grazing. Sporadic dry-season grazing or burning appeared to be compatible with survival of this herb, demonstrating the value of stock routes for rare plant conservation.

Australian flora has evolved in the presence of the grazing pressure of native fauna, including the historic megafauna. It is the additional pressure of domestic animals that has led to loss and or decline of native flora. Grazing of stock routes should preferably be sporadic and in the dry season because damage to pastures occurs with over-utilization in wet seasons and the consequences are felt in the succeeding droughts www.bom.gov.au/climate/cli2000/McKeon.html. Grazing requirements for stock routes therefore vary, with no grazing in some areas and intermittent grazing in most areas.

A network is worth more than the sum of its parts

The greatest value of the SRN and TSR is in their entirety as a continuous network from north-to-south and east-to-west. Hence the value of the whole network is greater than the sum of the value of the individual parts.

While the environmental values of some of the links have been degraded, vegetation rehabilitation experts are confident that many of those areas could be recovered by fencing with sporadic, preferably dry season grazing. This provides opportunities for the vegetation to recover and seed; rural communities to benefit from environmental infrastructure funding; rural employment to manage stock routes to enhance their biodiversity values, and injection of funding from carbon credits to selectively restore some tree cover to degraded sections of the SRN. This latter tree planting can also contribute to mitigation of climate change by absorbing CO_2 and slowing down the rate of climate change.

Advantages that make the case for turning the SRN into a *Reserve for Travelling Stock and Biodiversity*.

1. Afford protection for biodiversity in perpetuity
2. Protect the integrity of the SRN in its entirety to provide a continuous network for biodiversity
3. Strengthen environmental management of the SRN with fencing and a prescribed pattern of grazing that provides for short periods of grazing (preferably in the dry season only) followed by long rest periods only
4. Strengthen the case for access to funding for biodiversity conservation
5. Strengthen the case for access to funding for adaptation of native species to climate change
6. Facilitate access to carbon credits to assist in rehabilitating degraded sections of the SRN
7. Option to apply for classification as IUCN category VI protected areas as a multi-use protected area.

> *IUCN CATEGORY VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems. Definition: Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.*

Conclusion

The stock routes networks in eastern Australia provide a vital resource to assist biodiversity to survive climate change. They provide some of the only remaining healthy native vegetation in much of the Outback and so represent refugia for many species. The linkages that they create across the landscape provide essential corridors for species to move in response to changing environmental gradients. Meanwhile, they hold the potential to materially assist rural economies through the preservation of the Australian character of the Outback with promotion of ecotourism. Concurrently, the need for sporadic grazing to remove excess vegetation to reduce fires and prevent domination by some species is fully compatible with the use of the stock routes for travelling stock. Indeed, the value of the stock routes for livestock is likely to increase greatly in response to Peak Oil and the resultant soaring of fuel costs. It is an urgent national priority to protect, restore and re-connect the networks.

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