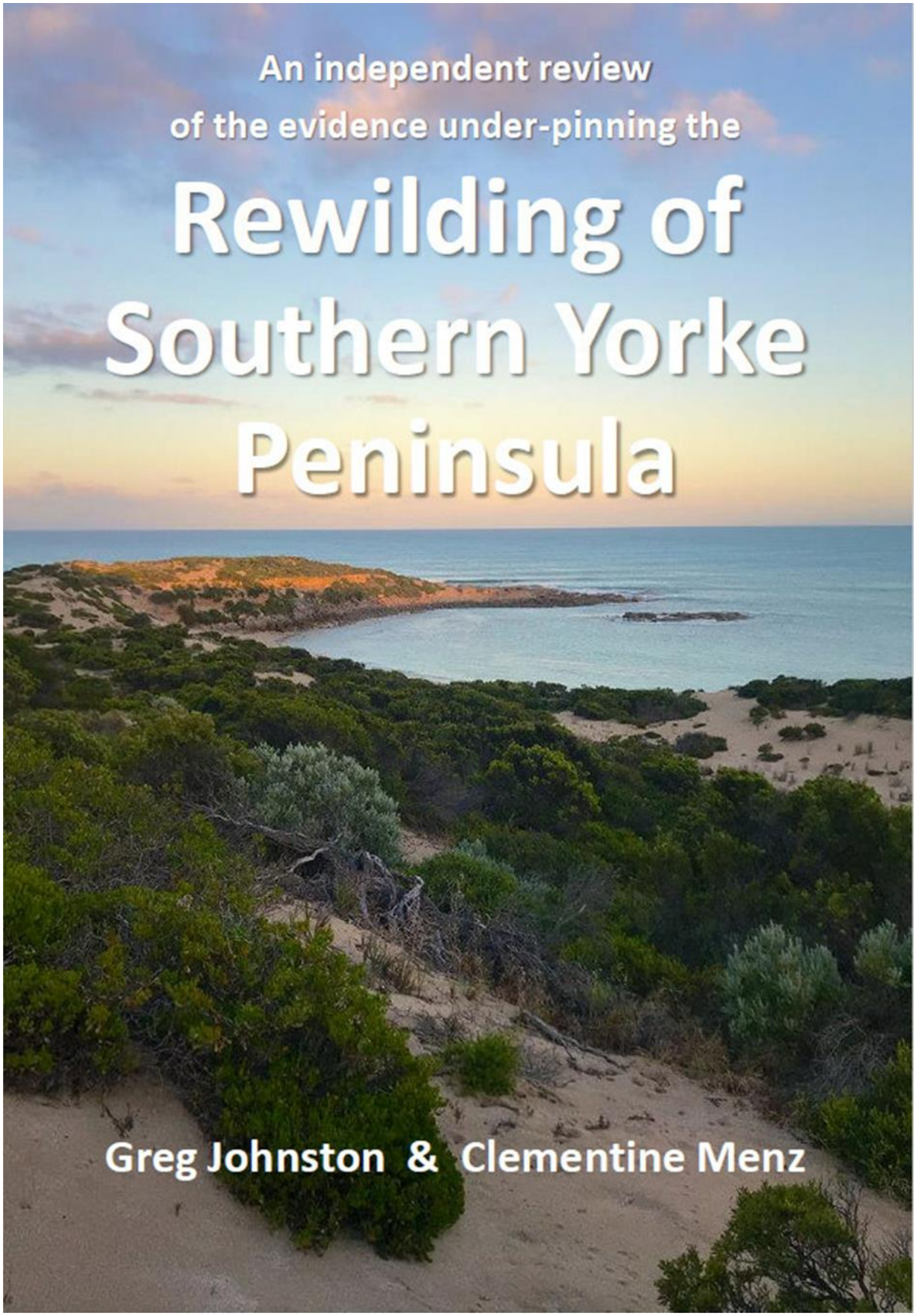
An independent review
of the evidence under-pinning the
Rewilding of
Southern Yorke
Peninsula
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Executive Summary

Southern Yorke Peninsula has changed markedly since European colonisation of the area in the 1830s. Temperatures have increased, rainfall has decreased, over half of the native vegetation has been replaced by agriculture, exotic plants and animals have been introduced, and 24 (80%) of the 30 non-volant native mammals that once occurred there are now locally extinct. These fundamental changes to the ecology of the Yorke Peninsula affect the sustainability of remaining native biodiversity and the livelihoods of people living there.

The rewilding of southern Yorke Peninsula project aims to re-establish lost ecological processes on Yorke Peninsula by controlling populations of key exotic animals (foxes, cats and mice) and reintroducing locally extinct native mammals to re-establish their ecological roles. Locally extinct mammals have been chosen to re-establish soil-engineers to improve water-permeability, mycorrhizal fungi and soil fertility (southern brown bandicoot and brush-tailed bettong), improve seed dispersal and recruitment of native plants (native rodents) and re-establish mammalian predators (red-tailed phascogale, western quoll and possibly Tasmanian devil). This report summarises the current state of scientific knowledge as it relates to each of these key components of the project.

Introduced mammalian predators have been responsible for biodiversity declines, species extinctions, reduced ecosystem services, economic losses, and health impacts on humans around the world. In Australia predation by introduced foxes and cats has resulted in population declines and extinction of numerous native mammals, including more than half of the species that are now locally extinct on Yorke Peninsula. Several Australian native mammal species currently persist only in cat and fox free refuges (islands and fenced areas on the mainland). Foxes and feral cats are recognised as key threatening processes under the Australian Environment Protection and Biodiversity Conservation Act 1999. Foxes incur significant costs to agriculture as vectors for invasive weeds and by preying on lambs. Cats incur significant costs to agriculture and human health as vectors of disease (e.g. toxoplasmosis and sarcosporidiosis). The presence of foxes commonly suppresses the density of cats, and fox control can result in an increase in the density of cats. Therefore, both species should be managed in concert. Both foxes and cats can be effectively controlled over large areas using sodium fluoroacetate (1080) meat baits of an appropriate type for each species. Following baiting, foxes and cats from surrounding areas commonly disperse into baited areas. Unless it can be curtailed, this dispersal reduces the effectiveness and increases the cost of baiting programs.

Barrier fences are widely used to limit dispersal of cats and foxes and provide safe havens for native mammals. Foxes and cats can scale netting fences over 2m high, leap over 1.4m high fences and chew through soft wire netting. Effective barrier fences should be made of hard wire netting fences at least 180 cm high with a foot apron and a 60 cm-wide curved overhang ("floppy top"). The use of metal (rather than wooden) fence posts greatly reduces the ability of cats and foxes to climb a fence. A "floppy top" stops animals from climbing over the fence. Monitoring and maintenance of barrier fences are important for long-term limitation t of cat and fox dispersal. Barrier fences have the disadvantage of limiting movement of non-target wildlife, such as kangaroos

and emus. Gaps in the barrier fences across Yorke Peninsula will allow some movement of cats and foxes and native wildlife where the fences cross roads and meet the coast. Nevertheless, the fences will greatly curtail dispersal of foxes and cats into the project area, enhancing the effectiveness and reducing the cost of fox and cat control.

Introduced house mice are one of the most important agricultural pests globally and incur significant costs to agriculture in the southern grain growing regions of Australia. Mice damage crops in the field, consume grain, and foul harvested grain in storage. Mice tend to be less common in intact native vegetation (< 6 mice.ha^{-1}) than in agricultural land. Mice use farm buildings and remnant vegetation as refuges when fields lie fallow but move into fields and breed-up as crops grow. Most agricultural costs occur during erratic mouse plagues, which occur when high food availability following rains allows population densities to reach >2,500 mice.ha^{-1}. Mouse plagues occur on average every seven years in South Australia. Currently mice are controlled using costly, toxic baits laid during plagues to reduce the magnitude of peak population density. Like baiting, predators are unlikely to stop plagues from occurring, but enhancing the density of predators should limit the magnitude of plagues at considerably less cost compared to pesticides. Small raptorial birds (barn owls, kestrels and black-shouldered kites) are the primary predators of mice in Australia, but their populations are limited in agricultural areas due to a lack of nesting sites. Provision of artificial nesting sites (nest boxes) and perches from which to hunt have been used in many parts of the world for over fifty years to artificially increase the density of avian predators to control rodents. Nocturnal barn owls have been the focus of this approach. Artificially increased densities of avian predators have resulted in reduced rodent abundance and increased crop productivity.

Ecosystem engineers are organisms that control the availability of resources to other organisms by making physical changes to the environment. Soil engineers dig burrows for shelter and turn over soil as they forage. The importance and effectiveness of each species of soil engineer can vary, suggesting that some redundancy is required to realise the full advantages of soil engineers in a landscape. Of the seven mammalian soil engineers that once occurred on southern Yorke Peninsula, only the echidna remains. Introduced rabbits do not provide the ecosystem services provided by native soil engineers. Southern brown bandicoots and brush-tailed bettongs have been chosen for reintroduction to Yorke Peninsula because they act as soil engineers that will help restore landscape function. Establishing an additional population will also assist established recovery programs for both species. Less than 2000 brush-tailed bettongs remain in the wild and they are one of the most threatened marsupials. Neither bandicoots or bettongs burrow, but individuals displace 4-5 tonnes of soil per year while foraging. The foraging pits they produce increased water infiltration, soil fertility, communities of mycorrhizal fungi and enhanced seedling recruitment and growth of native vegetation.

Remnant native vegetation on Yorke Peninsula is in gradual decline. Dispersal of seeds is important for recruitment in existing plant populations and allows plants to recolonise disturbed areas. Globally, rodents play an important role in seed dispersal and the dynamics of plant communities. While rodents consume seeds, they also disperse undigested seeds in their faeces and bury seed in caches where some of the seeds germinate. Seeds handled by rodents are more likely to germinate than seeds that have not been handled by them. The importance of rodents in plant population dynamics in Australia has been underestimated due to historical rodent extinctions and population declines. All eight native rodent species that once occurred on Yorke Peninsula are locally extinct. In addition to assisting dispersal and recruitment of declining plants, these missing rodents appear to have played a role in suppressing native, invasive woody shrubs.

Predators play a key role in maintaining species diversity and ecosystems globally. Dramatic re-organisation of ecosystems and biodiversity losses frequently follow the extinction of predators in marine, aquatic and terrestrial environments. Restoring and maintaining the ecological function of predators is a critical component of restoration ecology in general and of rewilding southern Yorke Peninsula in particular. All ten species of native predators on Yorke Peninsula are locally extinct. The red-tailed phascogale and western quoll are currently being considered for translocation to Yorke Peninsula because they are likely to control mouse and rabbit populations, and possibly feral cats. An additional benefit is the establishment of additional populations of these species for conservation. There are good grounds for going ahead with planned translocation of quolls and phascogales. Both are active, opportunistic, generalist predators. Historical accounts suggest that quolls were, at least partly, responsible for the failure of nearly 300 independent releases of rabbits in Australia between 1788 and 1900, suggesting they can regulate rabbit populations. Mice are a consistent feature of the diet of both western quolls and red-tailed phascogales, and make-up a large proportion of prey items consumed during mouse plagues by both species. Some preliminary discussions have also began regarding the potential to translocate Tasmanian Devils to southern Yorke Peninsula in 20 years' time. Tasmanian devils are the world's largest extant carnivorous marsupial and regulate the abundance of smaller native predators. The disappearance of Devils in some areas of Tasmania, due to facial tumour disease, has been accompanied by increases in the abundance of feral cats, leading to the suggestion that Devils may regulate cat populations. However, the critical information required to objectively assess this hypothesis are not yet available. The impact of devils on sheep is a point of social controversy in Tasmania, which has not been clarified in the literature available to us. Should the impact of devils on sheep be sufficiently low and the impact of devils on feral cats be confirmed, then translocating them to Yorke Peninsula may provide benefits to agriculture by reducing the incidence of feral cat and cat-borne diseases. The intervening 20 years prior to the potential introduction of the devils will allow for the collation of additional studies and information, enabling a considered evaluation of the risks involved to be made.

All species of mammals chosen for translocation to southern Yorke Peninsula have a naturally high tolerance to 1080 and are known to survive in areas where 1080 baits are used to control foxes and cats.

Key knowledge gaps are identified for each component of the project to guide research, monitoring and evaluation to aid adaptive management to maximise the project's chances of success. The southern Yorke Peninsula rewilding project presents an opportunity to (1) increase our understanding of Australian ecosystems, (2) understand how their historical decline has affected human endeavour, and (3) demonstrate rewilding as means to re-establish lost ecological processes on Yorke Peninsula with far-reaching implications for future of biodiversity and human society.