

Welcome to the inaugural issue of *Restore*, a free e-newsletter that provides a quarterly insight into what's happening in the ecological restoration and rehabilitation community around the world and likely to be relevant to restoration practitioners in Australasia. This first issue is brought to you by The Society for Ecological Restoration Australasia with generous sponsorship provided by **Natural Area Consulting Management Services**. The next issue will be in your inbox in July. As this is the first issue, we would appreciate your feedback, which you can provide using this [short survey](#). I hope you enjoy this first issue or our Society's newsletter.



Best wishes,

Kingsley Dixon (Chair, SERA)

Breaking News

As we go to press SERA has just announced the launch of the world's first national standard to guide restoration practice – *Standards for the Practice of Ecological Restoration in Australia* ([access here](#)). Three years in the making and with 12 key partner groups involved in its creation, this document has already spurred international action with SER International considering an 'International Standard' based on the Australian model.



Research

Controlling feral cats to save native mammals

Many studies are being conducted across Australia on the density, impacts, and behaviours of feral cats, but the largest of its kind – conducted at the Australian Wildlife Conservancy's Mornington-Marion Downs Wildlife Sanctuary in the Kimberly, Western Australia - found intensive fire and feral herbivory exacerbated cat predation. The study found that 28% of animals killed by cats were not eaten. This tendency for 'surplus killing' combined with higher impacts of cats in habitat opened up by fire or grazing, which makes hunting easier, helps explain why many small mammals in northern Australia have declined substantially only in the past few decades even though feral cats have inhabited the north for up to 170 years. However, the study also found there was no 'silver bullet' to solve the problem. Integrated solutions will still be required, including more feral predator-free areas, more effective baits and pursuing the scientific quest for regional-scale solutions. Read more: <http://www.australianwildlife.org/media/274631/saving-mammals-wildlife-australia-autumn-2016.pdf>



A cat caught the prowler by a camera trap.
Photo: Australian Wildlife Conservancy

Getting closer is the key to success

It is usual practice when restoring coastal wetlands to leave space between new plants to prevent overcrowding and reduce competition for nutrients and sunlight. Research suggests that this is less effective than assumed. In restoring degraded salt marshes in Florida, USA, and the Netherlands, researchers found that clumping newly planted marsh grasses, with little or no space in between, spurred positive interactions between the plants. In some test plots, plant density and vegetative cover increased by as much as 300 % in a season. The finding upends a 40-year-old theory borrowed from forestry. The researchers found that while plant spacing makes sense in a low-stress field or forest, it is different in the tough, volatile environment of redeveloping coastal wetlands. Read more of this research by Silliman and other in *Proceedings of the National Academy of Sciences* or a summary, <http://www.ecology.com/2015/11/13/coastal-wetland-restoration-success/>.

Local is best

Researchers have found that using local provenance seed is as good for grasslands as it is for forests. In Germany, using local seed is required when replanting forest trees, but this has not been considered necessary for the replanting of grasslands and meadows. Researchers studied the genetic differences between common grassland plants from various geographic regions of Germany and how these differences affected growth and flowering when planted at a range of sites, some out of their home range. One finding was that, on average, plants grown within their home range produced 7% more biomass and 10 % more inflorescences than plants of the same species that came from other regions. From 2020, grassland restoration in Germany will have to use indigenous seed. Two studies have been published in the *Journal of Applied Ecology*: one by Durka and others focusses on the genetic differentiation (<http://dx.doi.org/10.1111/1365-2664.12636>) and the other by Bucharova and others on the lessons from the experimental work (<http://dx.doi.org/10.1111/1365-2664.12645>). For a summary: <https://www.sciencedaily.com/releases/2016/03/160321081424.htm>.



The Field Scabious shows pronounced genetic differences between northern and southern Germany. Photo: Walter Durka.

Eastern Bettong engineering restoration

Australia's Bettongs, once exterminated as agricultural pests, are now threatened by habitat loss and introduced predators such as foxes and cats. Scientists recently learned that Bettongs act as 'ecosystem engineers', dramatically encouraging and enhancing Australia's forest habitat in numerous ways. Bettong restoration efforts are well supported by the national and state governments, with fenced-in populations thriving. At Mulligans Flat near Canberra, Australia, for example, Eastern Bettongs have been introduced into a fenced enclosure and the population has grown from 60 to 250 individuals in the past four years. Each individual has been estimated to move close to 8 kilograms (17.6 pounds) of soil per night. Read more about the project at <http://www.mfgowoodlandexperiment.org.au/bettong.html> and more about the case for reintroduction of bettongs in ecosystems at <http://news.mongabay.com/2015/10/amazing-but-overlooked-bettongs-the-case-for-australias-small-hopper/>.



Not just a hole in the ground - Bettongs dig thousands of small holes, creating reservoirs for rain in dry Australian forests. Photo: Nicki Munro.

Similar research in the USA is studying the effects of translocating California Ground Squirrels in conjunction with mowing and soil de-compaction. It was found that the engineering impact of Squirrel activity was both notable and persistent. Read more about the work by McCullough Hennessy and others in *Animal Conservation*: <http://dx.doi.org/10.1111/acv.12266>.

Buffering success

Researchers in New Zealand have assessed the effectiveness of riparian buffers in terms of impact on water quality and the macroinvertebrate community. In New Zealand, around half of the lowland water bodies do not meet water quality standards and there have been many projects over the past 30 years to restore riparian areas. The researchers found there were some improvements associated with riparian restoration but these were not consistent across all sites. Restoration increased dissolved oxygen and decreased turbidity but the macroinvertebrate response varied. Read more of this research by Collins and others in *Restoration Ecology*: <http://dx.doi.org/10.1111/j.1526-100X.2011.00859.x>.

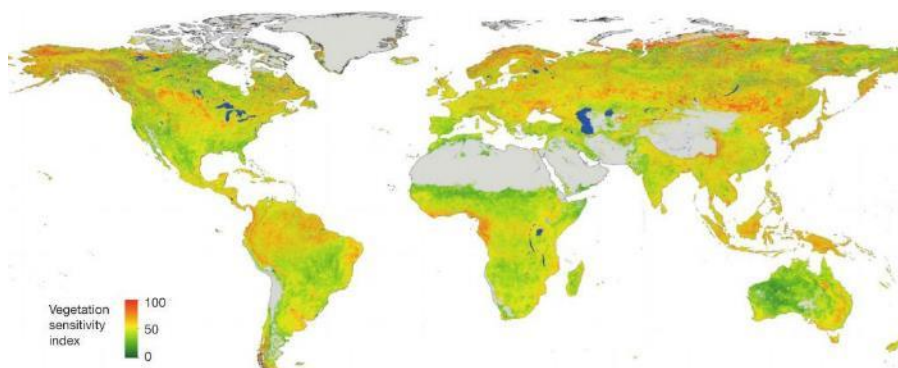


Riparian replanting and protection on the Waikato River, New Zealand. Photo: www.dairyatwork.co.nz

Restoration, adaptation and climate change

A review has concluded that one of the better options for mitigating the impacts of climate change is the protection and restoration of natural ecosystems. For example, research shows that as forest is cleared or degraded, there is a greater chance of drought occurring in that area. Similarly, natural coral reefs reduce the impact of sea level rise by providing storm protection and reducing wave energy by an average of 97%. Yet in some parts of the world coral reefs are being destroyed and used to build seawalls to serve the same function but far less effectively and cheaply. Read more of this overview by Martin and Watson in *Nature Climate Change*: <http://dx.doi.org/10.1038/nclimate2918> or a summary: <https://blogs.csiro.au/ecos/intact-ecosystems-the-best-buffer-against-climate-change/>.

In related work, scientists have mapped the world's vulnerability to impacts of climate change. The whole Earth was mapped in a grid of 3.2-square-km (2-square-mile) blocks, with each block assigned a sensitivity rating. For a summary: <http://www.sciencealert.com/this-map-shows-the-parts-of-the-world-most-vulnerable-to-climate-change>



The vulnerability to climate change map. Image source: www.sciencealert.com

Cross-benefits: people, places & wildlife

Indigenous carbon benefits

Australian researchers have used a combination of social and biological data to examine the factors influencing Indigenous communities' participation in carbon offset projects. They found that participation was seen as part of a broader cultural responsibility for landscapes, but that the link between social and ecological benefits needs to be developed. This study reveals climate change mitigation as a factor in Indigenous world views about what is needed to sustain cultural-social-ecological systems. Read more of this study by Robinson and others in *Environmental Science and Policy*: <http://www.sciencedirect.com/science/article/pii/S1462901115301088>.

Using ecosystem services to bring people and restoration together

The researchers argue the ecosystem services concept helps to identify the interventions needed to achieve both ecosystem health and social goals. They provide case studies to demonstrate their argument. One case study refers to the so-called 'Great Green Wall' stretching across the semiarid, highly degraded, and densely populated belt on the southern fringe of the Sahara desert. Cultural aspects are as important for success as technical and scientific aspects in such a project. The practitioners and scientists in the Great Green Wall project are working with motivated local communities on long-term projects aimed at kick-starting the restoration of natural capital at local scales. Ultimately, the local communities must be convinced that there is a tangible benefit for them in terms of their livelihoods and well-being. To read more of this study by Alexander and others in *Ecology and Society*: <http://dx.doi.org/10.5751/ES-08288-210134> [Open access]



Workers tending seedlings in Senegal as part of the Great Green Wall, a 15km wide strip stretching 7,600km from Senegal to Djibouti. Photograph: Seyllou Diallo/AFP/Getty Images sourced from <http://www.theguardian.com/environment/2012/jul/12/senegal-great-green-wall>

Revegetating the Hunter

Ecologically, the Upper Hunter region in NSW is unusual because the Great Dividing Range bends to the west in the area, allowing coastal species to move westward and western NSW wildlife to extend well to the east. However, the woodlands on the plains are largely gone, cleared for farming or destroyed by coal mining. A program is now in place whereby farmers sign a 10-year "goodwill agreement", setting aside a part of their land for revegetation with indigenous trees and shrubs. Landholders get shade and shelter plants, while limiting erosion and halting further fragmentation of vegetation. The five-year project will replant 452 hectares with 90,400 plants and protect a further 905 hectares and 21 kilometres of creeks. So far, 118 landholders have signed up. Monitoring by community bird-watchers has noted the reappearance of birds such as Speckled Warblers, Robins and Wood Sparrows, indicating a degree of success. Read more about this story: <http://www.smh.com.au/environment/conservation/stepping-stones-program-supports-farmers-to-replant-natural-habitat-after-mining-20160119-gm9lo1.html#ixzz43dFcRqeT>

Tourist photos telling the Guillemots story

In 1880, the picturesque Swedish island of Stora Karlsö became a nature preserve and, in the 1920s, to help fund the venture, the owners organized tours. The island remains a popular tourist destination, attracting about 10,000 visitors each year, and one its main attractions is its seabird colony. And that means that the colony of seabirds living on the island has had its picture taken over and over again, for almost 100 years. Researchers have used many of those photos to reconstruct the rise and fall of Common Guillemots, one of the largest Auk species. Those data show that despite the Guillemots declining early in the 20th century, their numbers have now risen to a historically high level. The population is currently increasing at an unprecedented rate of about 5% annually, whereas elsewhere it is decreasing. Read more: <https://www.sciencedaily.com/releases/2016/03/160321123530.htm>



Breeding Common Guillemots in the island of Stora Karlsö in 1960. Photo: Gösta Håkansson (Gotland museum collection)

Policies and standards

Australia's Threatened Species Strategy 2015

The Australian Government has established a new national approach to threatened species. *The Threatened Species Strategy* is a 5-year plan for prioritising effort and facilitating working partnerships between the community and all levels of government. The Strategy highlights how a combination of science, action and partnership can be used to achieve the long-term goal of reversing species declines and supporting species recovery. Read more:

<http://www.environment.gov.au/biodiversity/threatened/publications/strategy-home>

Techniques & tools

After the mines close

Mining is an activity that usually results in severe alterations to natural ecosystems. In this review of mine-site rehabilitation, it is argued that mining does not represent an insurmountable obstacle to restoration across all geographic locations, however, most major mining operations in Australia are located in regions that offer many challenges to post mining land restoration. Traditional restoration approaches may not always be appropriate. A major challenge lies in achieving the desired standards of biological conservation when ecological outcomes may not be readily predicted given the permanent changes to soil, water and vegetation dynamics caused by the mining activity. To read this work by Doley and Audet:

https://www.researchgate.net/profile/Patrick_Audet/publication/289507727_Chapter_4ID_38431_7x10_DD_2/links/568d79bd08aef987e565f848.pdf.



Permanent changes to soil, hydrology and topography might mean a different post-mine ecosystem to what was prior to mining activity. Photo: Wolter Peeters

Rapid wetland assessment

Researchers in the USA have developed a modified version of the Floristic Quality Index (FQI), the standard tool in use in the USA to assess the impact of wetland rehabilitation or degradation. Monitoring indicated that the FQI was time-consuming and field technicians' botanical knowledge was not always able to accurately identify all the plants in an area. The researchers found an abridged list of a wetland's dominant species was just as effective at predicting wetland quality as the standard version. More:

<http://www.sciencedaily.com/releases/2016/01/160114163033.htm>

A sponge for oil spills

Researchers in Australia have developed a new, highly absorbent sponge material based on a nano-powder. The powder has been bound into a sponge that can soak up a disproportionately large amount of oil and separate it from water. The nanosheet is made up of flakes which are several nanometres thick and has tiny holes which can increase its surface area per gram, enabling it to absorb oils and organic solvents up to 33 times its own weight. Read more of this development, published in *Nature Communications*:

<http://www.sciencelalert.com/scientists-develop-super-absorbent-sponge-material-to-soak-up-oil-spills>

Seasonal Herbaceous Wetlands Handbook

This handbook is designed to assist landholders in northern Victoria recognise and assess seasonally herbaceous wetlands and improve their understanding of the management actions that will help protect such areas. Available to download from: <http://www.necma.vic.gov.au/News-Events/News/ArtMID/431/ArticleID/182/Seasonal-Herbaceous-Wetlands-Handbook>

Headline projects

Great Barrier Reef healthier with no-take zones

A new study shows that no-take reserves have helped the Great Barrier Reef's corals to resist a range of disturbances and to recover more quickly from damage. Strategic management of the Great Barrier Reef Marine Park is based on a Representative Areas Program that uses a range of statutory 'no-take' reserves. The study used observations between 1993 and 2013 of 34 types of coral and invertebrates and 215 fish species on 46 reefs across the Great Barrier Reef, 26 of which were open to fishing and 20 were in no-take marine reserves. During the study period, several disturbances, including coral bleaching, coral disease, storms and outbreaks of crown-of-thorns starfish were recorded. The study showed that inside no-take marine reserves, the impact of disturbance was reduced by 38% for fish and by 25% for corals compared with unprotected reefs. Read more:

<https://theconversation.com/banning-fishing-has-helped-parts-of-the-great-barrier-reef-recover-from-damage-55828>



A damaged section of reef. The study showed that no-take areas resist damage better and recover more quickly than unprotected reefs. Photo by Tom Bridge, www.tethys-images.com

Restoration of the Monarch

US\$10 million is going into projects to restore up to 33,000 acres of habitat critical to the recovery of the iconic Monarch butterfly. An additional 200,000 acres of habitat is also being restored and over 750 schoolyard habitats and pollinator gardens supported. The Monarch undertakes a migration of thousands of miles over many generations from Mexico, across the United States, to Canada. However, the loss of habitat in North America means that there is a real risk that the species could disappear from the continent. Habitat restoration includes planting native milkweed for caterpillars and nectar plants for adults in both large, contiguous areas as well as in smaller patches, especially in edge habitat along the butterfly's migration route. More: <http://www.fws.gov/savethemonarch/>

A plan to repair ecosystem-level injuries to the Gulf of Mexico

A final ecosystem restoration plan for the Gulf of Mexico has been released, based on the assessment of impacts to the Gulf's natural resources and the services they provide following the Deepwater Horizon oil spill. Pending adoption, the plan allocates up to US\$8.8 billion for natural resource injuries under a proposed settlement with BP, resolving BP's liability for natural resource injuries stemming from the spill. The types of restoration in the plan address impacts at both regional and local scales. The five goals of the plan are to: 1) restore and conserve habitat; 2) restore water quality; 3) replenish and protect living coastal and marine resources; 4) provide and enhance recreational opportunities; and 5) provide for monitoring, adaptive management, and administrative oversight to support restoration implementation. Follow this story and access the plan: <http://www.gulfspillrestoration.noaa.gov/2016/02/update-on-the-comprehensive-restoration-plan-for-the-gulf-of-mexico>.

Results on the ground

Birds dropping the evidence

Fruit eating birds disperse seed, which can be a critical component of a restoration project. Evaluating whether or not the restoration is successful to the point that birds are dispersing seed is a time-consuming and highly technical process. Researchers tested the use DNA barcoding of bird droppings instead. They found that it was effective at identifying what fruit was being eaten, and where seed dispersal was occurring. In this instance they were also able to confirm that restoration planting had been successful as the DNA from target species was identified in the droppings. Read more of this work by Galimberti and others in *Conservation Ecology*: <http://dx.doi.org/10.1111/cobi.12687>.

Grassing up

The Grassy Groundcover Research Project has been recently reported to include nearly 100 sites on ex-agricultural land and roadside where complex grassland plant communities have been consistently reconstructed on bare fields. Across the country, native ground-layer species are being successfully returned as functional, resilient and attractive vegetation. Many Grassy Groundcover Research Project sites are now eligible for protection under the Commonwealth *Environment Protection and Biodiversity Conservation Act*, with one site (near Geelong, Victoria) assessed as high to very high conservation significance. Critical to success is the development of Seed Production Areas capable of supplying large quantities of high quality seed of known genetic origin and diversity. Read more at <https://www.greeningaustralia.org.au/project/grassy-groundcover-restoration> Or take a [video tour](#) of one of the Seed Production Areas.



Native seedlings grown from provenance seed is one factor contributing to the successful reinstatement of grassy groundcovers. Photo: Greening Australia.

Living shoreline for Chesapeake Bay

In 2000, a different approach was taken to controlling erosion and restoring part of the Chesapeake Bay, USA, shoreline and the area now has populations of worms, clams and shrimp approaching those found in a natural marsh. The 'living shorelines' approach involved replacing a failing concrete revetment with rock jetties, carefully shaped to protect marsh grasses that had been planted on a small replenished beach, and the placement of an oyster reef offshore to help break the motion of waves. Since then, the calmer wave action has deposited sand on the beach, and the marsh has expanded seaward, providing critical habitat for the young fish, crabs and terrapins, and filtering the nutrient- and sediment-laden water washing off the land. To read more:

https://www.washingtonpost.com/national/health-science/reshaping-the-chesapeake-bay-one-living-shoreline-at-a-time/2016/03/14/9c223a4c-c51d-11e5-8965-0607e0e265ce_story.html



A stretch of Chesapeake Bay shoreline where plantings and rock jetties are providing habitat and preventing erosion. Photo: Gabriel Popkin.

Tracking the benefits of habitat restoration for fish

'Intensively Monitored Watersheds' uses technology to provide researchers with sufficient detail over longer timeframes to enable them to identify whether fish populations are increasing and whether this is due to the improvements in the habitat. Researchers used this approach in 17 watersheds in the USA Pacific Northwest. Their findings from various sites include a 250 % increase in numbers of juvenile fish in areas with restored habitat compared to those without; a 400 to 800 % increase in fish numbers in response to the reconnection of side channels; and a 175 % increase in juvenile Steelhead in response to reduced erosion and a higher water table. They have also identified Coho Salmon migration patterns that have implications for the resilience of local populations of this species. Read more of this work by Bennett and others in *Fisheries*, <http://dx.doi.org/10.1080/03632415.2015.1127805> or a summary, <https://www.sciencedaily.com/releases/2016/02/160201104034.htm>.



Juvenile Coho Salmon survival was found to have increased 50 % in summer and 300 % in the winter after restoration improved rearing habitat. Photo: www.nwfsc.noaa.gov

Good and bad news for Carnaby's

The restoration of habitat for southwest Western Australian's endemic and Endangered Carnaby's Black Cockatoo has been seeing success. Revegetation of what was previously pastoral land started in 2010 and was badly needed because Carnaby's Black-Cockatoo requires a close association between breeding and feeding sites during the breeding season. 30 species of endemic understory species were all identified as critical Cockatoo habitat species. Six years after it began, the project has reduced the threat from invasive weed species and improved vegetation by direct seeding approximately 54 kilograms of seed and planting 119,258 seedlings. Read more:

<https://www.greeningaustralia.org.au/news/restoring-habitat-for-the-endangered-carnabys-black-cockatoo>.

However, a major new threat has recently emerged: the new 'Green Growth Plan' for Perth and the nearby Peel region could pave the way for the clearing of tens of thousands of hectares of important feeding and roosting habitat. Under the current draft plan, which is open for public consultation until May 13, Carnaby's will lose more than 50% of their remaining feeding habitat in the Perth-Peel region. Read more:

<https://theconversation.com/cocky-count-how-perths-green-growth-plan-could-wipe-out-was-best-loved-bird-56442>



Carnaby's Black-Cockatoo. Despite progress, population counts over the past six years of suggest that the population has dropped by 15% each year. Photo:-Margaret Owen.

Taking a long view

From the 1940s to the 1970s, New Bedford Harbour, in Massachusetts, USA, was on the receiving end of waste containing PCBs and heavy metals. 18,000 acres were contaminated: one location having the highest concentration of PCBs ever recorded in the marine environment. In 1992, natural resource damage assessment settlement was reached with the responsible parties for \$20.4 million. Since 1998, 37 restoration-related projects have been implemented, supporting the preservation more than 690 acres of land, helping to restore and enhance wetlands and fish and bird habitats. To read more of this ongoing success story: <https://darrp.noaa.gov/hazardous-waste/new-bedford-harbor>.



The original Acushnet Sawmill Dam contributed to water quality problems in New Bedford Harbour.



A fishway was constructed and the site rehabilitated



3 years after construction.

All images: <https://darrp.noaa.gov/hazardous-waste/new-bedford-harbor>

About *Restore Australasia*

Restore is an e-newsletter brought to you by the Society for Ecological Restoration Australasia (SERA). It is issued quarterly and PDF of back issues are available from our [website](#).

You are welcome to contact the [editor](#) of *Restore*, Dr Liz Baker, with any comments, concerns or suggestions for stories.