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# Scientific Expedition Group Inc.

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Cover Photo: Southern brown bandicoot. Photo: Luke Price Rear Cover Photo: Australian sea lion. Seal Bay, Kangaroo Island. Photo: Alun Thomas

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The Scientific Expedition Group is a not-for-profit organisation which began in 1984. SEG undertakes several expeditions each year to record scientific information on wildlife and the environment in many parts of South Australia.

A major expedition to conduct a biodiversity survey occurs each year over two weeks. Scientific experts lead volunteers in surveying mammals, reptiles, invertebrates, vegetation, birds and physical geography. The data collected on each survey are archived with the relevant State scientific institutions to ensure they are available to anyone interested in our State's environment.

In addition to the major expedition, a number of trips for the Vulkathunha-Gammon Ranges Scientific Project are organised annually. A long term study of rainfall on the ranges and of water flow in arid-zone creeks is undertaken. All data are supplied to the Department for Environment and Water and to the Bureau of Meteorology and are available for analysis.

SEG conducts four-day biodiversity surveys at eight different sites each autumn and spring in the Heritage Area of scrub on "Minnawarra" farm near Myponga. Data collected are entered into the Biological Data Base of SA. SEG also conducts mallee-fowl monitoring in the Murraylands.

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## **EDITORIAL**

The adage, "Think global, act local" came to my mind as I prepared this issue of SEGments.

On the global end we all know of the terrible consequences of climate change with examples in the news every day. There is no doubt that climate change is causing droughts in some countries and flooding in others. Earlier climate change was referred to a global warming and the deniers argued that as some places were not warming so that the phenomenon was not happening. Climate change is a more appropriate general nomenclature. Nevertheless, warming is occurring and causing sea levels to rise to the detriment of low-lying countries including many of our Pacific Ocean neighbours. This warming is being caused essentially by increases in carbon dioxide and methane in the atmosphere which causes a blanketing effect to the Earth. Individually we can only do a little about methane but we can do more about carbon dioxide.

Another example in my opinion of "think Global" has been the recent COP27 conference held in Sharm El Sheikh in Egypt. At this United Nations conference it was reported that participants were looking at the global effect of climate change on many countries and trying to work out ways of financially assisting those countries. To a lay outsider it seems more time was spent on that than actually combatting the climate change itself. Certainly at earlier conferences carbon dioxide emission targets were set. I may be cynical, but it is hard to believe the ambitious target that have been set will ever be met other than by fudging the figures.

It is not generally possible for us as individuals to act on a global scale but we can and must act on a local scale.

On the adage of "Think global, act local" in this edition of SEGments there is an excellent and thought provoking article by Helen Johnson on how South Australia will meet its Paris Agreement targets. This article recognises the global action needed to combat excessive climate change but at the same time it looks at what action is being taken locally to avoid the use of fossil fuels which causes carbon dioxide to be released into the atmosphere. Also, she discusses carbon retention as either "green carbon" in the soils or "blue carbon" in the seas as a means of preventing excess carbon dioxide in the air.

The article by Rhys Morgan and Sam Sutherland on "The Bandicoot Superhighway Project" is a good example of acting locally. While ostensibly it is an article on the project to support southern brown bandicoots by planting suitable habitat for bandicoots to live in and to move to new areas to encourage genetic diversity. Such plantings have the added advantage to capture carbon from carbon dioxide in the atmosphere and fix it in the soil.

We, as individuals, can do our part in attempting to alleviate climate change.

We can:

- Avoid sending rubbish to landfill. Rubbish dumps are a significant source of methane emissions from rotting waste. Much of our waste can be composyed.
- Plant and maintain vegetation as a carbon sink. Vegetation has other benefits such as improved habitat and local cooling.
- Use public transport as much as possible and keep motor vehicles well maintained. Both of these will reduce the burning of fossil fuels.

It is our responsibility as global individuals to do our part to prevent climate change.

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## THE BANDICOOT SUPERHIGHWAY PROJECT Rhys Morgan - Nature Conservation Society of SA Sam Sutherland - Landscapes Hills and Fleurieu

#### The Southern Brown Bandicoot

Australia's shameful record of mammal extinctions is well documented. Since colonisation thirty-eight mammals have been lost, and currently there are fifty-two native mammals classified as critically-endangered or endangered. Not longago South Australia was home to creatures like the Lesser Bilby (Macrotis leucura), Golden Bandicoot (Isodon auratus) and Eastern Barred Bandicoot (Perameles gunnii), all belonging to the marsupial order Paramelemorphia. Today, only one Paramelemorphia species remains in the wild in South Australia, the Southern Brown Bandicoot (Isodon obesulus obesulus). Somewhat amazingly, this species persists across the Mount Lofty Ranges as well as on Kangaroo Island and in the lower South East. In the Mount Lofty Ranges, bandicoots also occupy the peri-urban landscape, and some landholders have the joy of spotting these wonderful creatures in their backyards! Nevertheless, Southern Brown Bandicoots (hereafter referred to as bandicoots) are nationally endangered.

Adult bandicoots are around 30 cm in body length and have a tail length of around 12 cm. Males can weigh up to 1850 g and females can weigh up to 1200 g. They have a large rump and their brown fur may appear to glisten with golden flecks which are actually guard hairs, the outermost layer of hair which is responsible for 'water-proofing'. They have a long tapering snout which leaves a distinctive conical shaped hole where they dig in search of food. Their diet consists of invertebrates, fruit, seeds and fungi. It has been estimated that a single bandicoot can turnover up to 4 tonnes of soil in a year! This prolific digging has a positive effect on soil health (i.e. aeration and fungi dispersal) and makes the bandicoot an ecosystem engineer. They have a remarkably short gestation period of around 11 days – the shortest of all marsupials.

#### Why they are threatened

Like most native mammals, bandicoots are threatened by a range of different factors. One major threat is habitat loss, with only around 13% of native vegetation remaining in the broader Mount Lofty Ranges area. The remaining vegetation is highly fragmented. For example, approximately 70% of native vegetation patches are less than 10 hectares in size. This fragmentation makes it easier for invasive plants and animals to invade and it also inhibits the movement of bandicoots between patches, which may lead to reduced geneflow and lower genetic diversity. Overgrazing by herbivores including over



A Southern Brown Bandicoot with hills resident John Nichols

European rabbits (Oryctolagus cuniculus) degrades their habitat. Of course, weeds also degrade bandicoot habitat, although this issue becomes rather complex as bandicoots can utilise certain weeds – more on that later. Predation by the European red fox (Vulpes vulpes) and feral and domestic cats (Felis catus) are also considered a threat to bandicoots. However, where there is dense suitable habitat, bandicoots can persist despite the presence of these predators. Finally, fire is an important consideration for the conservation of bandicoots in the Mount Lofty Ranges. Appropriate fire regimes (i.e. suitable timing, scale, intensity) are important for maintaining habitat quality, particularly in fire dependent ecosystems types, like heath.

Despite these threats, the bandicoot still hangs on, including in peri-urban landscapes - and there are a few good reasons why. They will utilise exotic plants as cover, with blackberry thickets providing particularly good protection from predators. However, blackberry is a serious environmental weed and is therefore often targeted for control. These kinds of interactions between native and non-native species in novel ecosystems are forcing us to rethink our traditional approaches to conservation. The type of blackberry control required at a given site is therefore dependent on the presence or absence of bandicoots. If bandicoots are present, a staged removal approach, which maintains sufficient cover is best. Bandicoots are persisting in the Mount Lofty Ranges because they occupy dense vegetation which allows them to co-exist with feral predators. Critical weight range mammals in the arid zone, where vegetation is much sparser, have seen greater declines. Another notable factor in the bandicoot's persistence ject and this is carried out on both private land, and public are the many dedicated volunteer groups across the region helping to keep our remnant vegetation in good condition through weeding and restoration. Volunteers play such an



A Southern Brown Bandicoot Photo: Alex Chu

abundant Western Grey Kangaroos (Macropus fuliginosus) and important role in conserving our wildlife and their contribution cannot be overlooked.

#### The birth of the project

One such community group, Sturt Upper Reaches Landcare Group, have been working tirelessly to improve and connect habitat across their local community in the central Adelaide Hills. In 2019 they worked with the Hills and Fleurieu Landscape Board and the Department for Environment and Water to develop a landscape scale project, now known as the Bandicoot Superhighway. The project has since been funded by the Foundation for National Parks & Wildlife and the Australian Government through the Environment Restoration Fund. The project was formalised in 2021 and includes four additional partners including the Nature Conservation Society of SA, Green Adelaide, University of Adelaide and Friends of Parks Groups. The project was founded on a community-led approach and it remains community-owned.

The long-term aim of The Bandicoot Superhighway Project is to reduce the extinction risk of the bandicoot in the wider Mount Lofty Ranges region and to improve its conservation status. As part of this broader aim, the project is striving to facilitate an ecologically functional corridor of habitat across the region. This will not only benefit bandicoots, but it will have co-benefits for a broader range of biodiversity such as other small mammal species and small-bodied woodland birds which depend on high quality habitat with good connectivity. The project is now well underway and has already achieved a great deal.

#### **On-ground action**

Direct on-ground action is a key component of the proland such as conservation parks. Revegetation planting is being undertaken to increase the area of habitat and connect small habitat patches. The project has developed a demonstration bandicoot habitat revegetation site in Mark Oliphant Conservation Park. Community and corporate planting days have been held at the site with 13,300 seedlings planted - an immense effort which could not be achieved without the help of volunteers. Some key plant species used at this site include Yacca (Xanthorrhoea semiplana ssp. semiplana), Prickly Tea-Tree (Leptospermum continentale), Mount Lofty Ground-berry (Acrotriche fasciculiflora), Red-fruit Cutting-grass (Gahnia sieberiana), Rush Sedge (Carex tereticaulis), Hop Goodenia (Goodenia ovata) and Native Raspberry (Rubus parvifolius). These species are all native to the local area which sits within a higher rainfall area of the Mount Lofty Ranges. They create dense cover which is ideal for bandicoots to shelter and forage in. Importantly, this revegetation site has been fenced to exclude large herbivores such as Western Grey Kangaroos. This improves seedling survivorship by reducing grazing pressure, particularly on palatable species. The planting at Mark Oliphant provides a publicly accessible example of good bandicoot revegetation that will be reinforced with interpretative

signage. Another planting event at this site is planned for June 2023.

Private landholders with Heritage Agreements bordering Mark Oliphant Conservation Park have been assisted with weed control on their properties which will minimise weed invasion from surrounding areas. In the last 12 months, weed control has also been undertaken at 11 sites, across more than 50 hectares, in areas of priority native vegetation supporting habitat for bandicoots. Additionally, 17 hectares of conservation area was fenced to exclude livestock to prevent the degradation of bandicoot habitat and facilitate an increase in the total area of habitat for an isolated population of bandicoots.

Prescribed burns are another restoration action that can be considered to improve bandicoot habitat. The burns can help re-set the system and facilitate the development of a dense understorey by stimulation of the soil seed bank. A prescribed burn was undertaken by the National Parks and Wildlife Service South Australia (NPWSSA) Burning on Private Lands Program to assist with the restoration of over 15 hectares of potential bandicoot habitat. Pre-burn activities undertaken by the Bandicoot Superhighway team included remote camera surveys for bandicoots in the planned burn area and adjacent habitat to establish a baseline for future surveys. Bandicoots were found in the adjacent habitat but not the planned burn area, where there was less suitable habitat. Ongoing bandicoot surveys at this site will help inform future prescribed burn planning.

# Volunteers hard at work planting native understorey plants at Mark Oliphant Conservation Park

#### Utilising new technology

Another aspect of the project is surveying of bandicoots to improve our knowledge of their regional distribution. This is important because we know that having high quality occur-



Volunteers hard at work planting native understorey plants at Mark Oliphant Conservation Park



A Southern Brown Bandicoot captured on a wildlife camera and recognised by the eVorta machine learning technology

rence data is critical for making well informed management decisions. The project deploys wildlife trail cameras across the region to detect bandicoot presence. Often, these cameras will be used to confirm bandicoot presence at potential revegetation and weed control sites. All the data captured on the cameras is collected and will be uploaded to the Biological Database of South Australia (BDBSA). This process is more efficient than ever before thanks to new machine learning technology. The project is using 'eVorta' software which can accurately identify and discriminate between different species caught on cameras in real time. This software 'learns' to identify a species every time it sees an image and therefore, over time, it gets increasingly better at identification. Ultimately, this means that project staff and volunteers do not have to sift through thousands of images looking for bandicoots. Instead, eVorta is constantly identifying all animals captured and relaying that information directly to the project. In its infancy, the camera monitoring program has recorded 25 images of bandicoots across four sites out of a total ten monitoring sites.

A bandicoot superhighway data portal has also been developed to allow the public to record their own sightings (www.bsh.org.au). Public observations are increasingly becoming a valuable source of information for land managers, and it is hoped that people's sightings will contribute to updating our knowledge of the bandicoot's regional distribution.

#### **Building community capacity**

Building the capacity of the community to engage in effective conservation is one of the aims of the project. In recent years we have seen an explosion of citizen science projects and general interest in environmental issues. One of the problems often faced by members of the public and community groups is that while they have all the passion and energy in the world, they sometimes lack the skills, knowledge or confidence to undertake conservation and land management. The project has been addressing this issue in a number of ways. This includes developing a project interest form and flyer to connect people interested in learning more about the bandicoot superhighway project. Several bandicoot training days and workshops have been delivered, providing practical advice on managing bandicoot habitat, small mammal identification and demonstrating how to detect and survey bandicoots.

Another way we empower landholders is by providing them with site reports after we have assessed their property for bandicoot habitat. These reports aim to inform landholders of the flora and fauna that they have on their property or nearby. This is often an important step in enthusing people about conservation. The report also details the condition of their vegetation and recommends some practical steps which may be taken to enhance the habitat.

Another initiative in development is a handbook of habitat management guidelines for landholders. This resource is designed to be readily accessible and easily interpreted by landholders who wish to manage their property for bandicoots Bandicootsuperhighway/ and other biodiversity. The handbook will empower landholders to take practical restoration actions on their properties, from best practice weed control to bushland regeneration techniques.

The Bandicoot Superhighway project represents a highly collaborative, dynamic and community-oriented model of conservation, that is well positioned to achieve demonstrable and effective outcomes for the Southern Brown Bandicoot.

#### Acknowledgements

The Bandicoot Superhighway is a collaboration between Sturt Upper Reaches Landcare Group, Nature Conservation Society of SA, Landscapes Hills and Fleurieu, Green Adelaide, National Parks and Wildlife SA, University of Adelaide and Friends of Parks Groups. This project is funded by the Foundation for National Parks & Wildlife and the Australian Government Environment Restoration Fund.

#### Links and Further Information

Report bandicoot sightings: www.bsh.org.au Register your interest: https://bandicoots.paperform.co/ More information: https://www.landscape.sa.gov.au/hf/ our-priorities/nature/nature-projects/bandicootsuperhighway Find us on Facebook: https://www.facebook.com/ Find us on Instagram: @bandisuperhighway

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Attendees of a community workshop gather to listen to Sturt Upper Reaches Landcare President Danny Rohrlach

## HOW WILL SOUTH AUSTRALIA ACHIEVE ITS PARIS AGREEMENT TARGETS?

## Helen Johnson

#### Introduction

The South Australian government has a goal to reduce the state's greenhouse gas emissions by more than 50% below 2005 levels by 2030, and to achieve net zero emissions by 2050. In the 2020 financial year, South Australia emitted 25.4 million tonnes carbon dioxide equivalent ( $MtCO_2$ -e). This figure represents a 31% reduction in greenhouse emissions over 2005 levels, 2% higher than 2019 levels. In 2020, <u>emissions reduction</u> figures from land use, land use change and forestry were about half of the previous year, perhaps reflecting the effects of the bushfires in late 2019, and early 2020.<sup>1</sup> South Australian emissions per capita are around 14t which is lower than the national average of 19t, although there is a lot of variability across states and territories.

About equal share of South Australia's 31% reduced emissions have come from the renewable energy sector (wind and solar) replacing fossil fuels, and from negative emissions through sequestering carbon through increases in forestry and changes to land use.<sup>2</sup> Storing carbon in land systems using plants, in pastures, woodlands, forests, and biodiverse plantings; and in ocean systems, through algae, is probably the **most important** means by which the earth will move to a stable (although still warming) climate. South Australia must aggressively support initiatives for smart land and ocean use within our vast state. These negative emissions will be necessary to reach 50% net zero in 8 years.

Although South Australia has made good progress in reducing its carbon emissions by transitioning to renewable energy and by capturing carbon in the landscape, it will require a concerted effort to eliminate emissions from transport fuels (25%) and agriculture (23%). Emissions from manufacturing and construction, industrial processes, energy industries and the waste sector total 48% (contributions from transport fleets employed in these industries are accounted for twice in these percentages). The gas industries, mostly based at Moomba in north east South Australia contribute a startling 10% to emissions as so called 'fugitive emissions' from purifying natural gas and from leakages when the gas is distributed to South Australia, NSW and Queensland via the East Coast domestic gas pipeline network.<sup>2, 3</sup>

Most Australian states and territories, and quite recently the Federal Government, have stated goals of reaching net zero by 2050. The Climate Council defines 'net zero emissions' as achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions taken out of the atmosphere. Australia's former Chief Scientist, Alan Finkel thinks that 'zero' means "low" or very "low", where "low" means 10% more greenhouse gas emissions produced than are taken out of the atmosphere. Not all initiatives will reduce carbon emissions in every sector to zero, but as stated previously there are enormous opportunities to store carbon in the ocean and in the land, offsetting our human-produced and geological CO<sup>2</sup> emissions.

#### South Australia's renewable energy resources

Quoting directly from the South Australian government Financing Authority "Renewable Energy" website <sup>4</sup>:

South Australia boasts:

 more than one in three homes with rooftop solar, one of the highest per capita levels of installed residential solar anywhere in the world

 $\cdot\,$  three large scale solar farms with a generating capacity of 378 megawatts

 large scale wind farms which generated 41% of South Australia's electricity in 2020-21, including the Lincoln Gap Wind farm

 four grid-scale batteries, headlined by the worldrenowned Hornsdale Power Reserve

 one of the highest uptakes of residential batteries in the world - over 34,000 batteries totaling over 355 megawatthours

 more than 10,000 residential batteries enrolled in virtual power plants, including South Australia's Virtual Power Plant

• world class wind and solar resources that provide the perfect environment for global supply of green hydrogen

"South Australia, widely regarded as the most world's most advanced gigawatt-scale grid in the transition to wind and solar, set a new record for instantaneous share of 136.6% of domestic demand on Sunday 17<sup>th</sup> April 2022 at 4:30 am." Generated electricity was entirely from wind and simultaneously the state was exporting 500MW to Victoria, **and** charging the state's big batteries.<sup>5</sup>

By 2021 on average, South Australia generated almost 66% of its electricity from renewable energy. Of that 66%, 43% is generated from 16 wind farms generating over 2GW, and 57% is due to solar and battery storage. The remaining 33% is from diesel and gas generation adding to the state's greenhouse gas emissions. It took 15 years for South Australia to move from 1% renewable energy to almost 66% through concerted state government efforts. The goal of achieving 100% renewable energy should be easily achievable by 2030 and likely much earlier. In 2021 our state was powered exclusively by renewable energy for 93 hours, which is truly world-leading.

South Australia is expected to set more benchmarks for its wind and solar share now that the amount of gas generation has been reduced to a minimum at times of high renewable generation due to the installation of synchronous condensers, and because importantly the Australian Energy Regulator (AER) has issued draft rule changes to prevent 'price gouging'. AER revealed that power providers were using rules (intended to maintain grid security) to arbitrarily turn off renewable energy generation, including home solar panels during periods of low or negative electricity prices.

When the new transmission link to NSW (with a spur line to Victoria) is complete in 2025, more wind and solar will be added to the grid allowing another 800MW to be exported interstate. SA's abundant energy will help stabilize grids across NSW and Victoria as their coal-fired power stations are shut down and those states aggressively build renewable energy infrastructure. In 2021 NSW averaged 24% renewable energy and Victoria averaged 31%. They have a long way to go to reach their renewable energy goals.<sup>5</sup>

'Green' hydrogen will contribute to the state's renewable energy, but most importantly will assist South Australia's goal of achieving zero carbon emissions by or before 2050. Green hydrogen allows South Australia to rethink ways to generate and store energy, to power transport fleets and agriculture machinery, heat homes and offices, decarbonise the mining industry, produce 'green' steel and other green metals, and produce ammonia and fertiliser in a more climate-friendly way. The price of producing hydrogen from plentiful solar and wind electricity has dropped substantially in the last 20 years.

#### Creating a sustainable Adelaide

South Australia's quest to reduce greenhouse gas emissions began in 2003 when Adelaide's first 'Thinker in Residence' Belgium Herbert Giradet advised the Rann government on how Adelaide could become a sustainable city. As a European, Giradet brought new ideas to South Australia.

Giradet knew that 21<sup>st</sup> Century cities needed to "fundamentally reconfigure the way they use energy technology, ensuring that renewable energy, and efficient and circular systems of resource use underpin their existence" assuring sustained well-being for their populations.<sup>6</sup>

Over two months Giradet advised the government on energy efficiency, renewable energy, water security, zero waste, sustainable transport, nature and the city, and green business. The Rann/Weatherill governments adopted a number of his recommendations for Adelaide and set to work over the next 15 years to create a more 'liveable' city, with aspirations towards a circular economy.

From the 2000's government initiatives were: water security provisions including watering restrictions, a desalination plant; recycled water for watering parklands; improved wetlands (often a local council initiative); strong support for the delivery of water through the MDB Plan; reduced landfill from better green bin and composting facilities; efforts to reduce waste; a greener more biodiverse and informed city; increased tree planting; bicycle lanes and dedicated bus lanes across the city; free public transport for seniors at off peak times and free travel for all within the city; hubs for bus routes and more frequent bus timetabling; modern trains and trams with electrified power plants; modern buses running on hydrogen fuel cells; solar panels on state schools and government buildings; and household solar hot water service subsidies, amongst other initiatives.<sup>6</sup> The Rann government's first wind farm, Canunda, was built in 2005 in the state's south east and the move to build more wind farms and then solar farms began in earnest.

Giradet's residency propelled Adelaide, its urban surroundings and eventually South Australia towards a lower emissions' future rather earlier than the other Australian states. The Rann government had assessed that climate change would affect South Australia significantly and would fundamentally change the capacity for South Australia to be liveable and to replicate the economy it once had. 'Going early' gave South Australia an advantage, since offshore investors had ready access to funding available through the Renewable Energy Target introduced by the Howard government, and increased under the Rudd government.

#### Life and its environment

Living things that photosynthesize through converting the sun's energy play a key role in regulating global climate and shaping the environment. As Pulitzer Prize winner and naturalist, Edward O Wilson wrote: "Life operates on only 10% of the Sun's energy reaching Earth's surface, that portion fixed by photosynthesis of plants." However of more importance than land-based plant life is life in the oceans; algae, tiny creatures that do most of the work are "light capturers [and] are not plants in the traditional land-bound sense. They are phytoplankton, microscopic single-celled algae carried passively by water currents. Cell for cell plankton algae fixes more solar energy and manufactures more tissue than plants on the land, and they grow, divide and die at an immensely faster pace". By keeping our oceans habitats healthy we will ensure that phytoplankton can grow and flourish and help reduce carbon emissions.<sup>7</sup> Phytoplankton have a role in seeding ocean clouds that importantly act as sunshades and help cool the planet.

#### Blue carbon

'Blue carbon' is carbon captured and stored by the world's oceans. Protecting and restoring **blue carbon ecosystems** is now recognized as very important because of their high carbon sequestration rates and potential for climate change mitigation. Blue carbon is captured in coastal ecosystems in algae, microalgae, seagrass meadows, saltmarshes, mangroves and tidal marshes. Blue carbon can remain in the sediment for thousands of years making it one of **the longest-term natural solutions** to climate change.

In July 2022, the Australian government Department of Climate Change, Energy, the Environment and Water announced a \$9.5 million grant to support new projects to help restore blue carbon ecosystems. South Australia will receive \$2.9 million to advance *the South Australian Blue Carbon Ecosystem Restoration Project* led by The Nature Conservancy Australia. The grant will support efforts by the Conservancy and its partners to restore and enhance 12,400 hectares of mangroves and saltmarsh habitats located 50 km north of Adelaide in the Adelaide International Bird Sanctuary. "The Blue Carbon Strategy for South Australia 2020 –2025" establishes evidence-based projects and underwrites research towards blue carbon ecosystem protection and restoration. In collaboration, the Department for Environment and Water, the University of Adelaide and Flinders University, facilitated by the Goyder Institute are aiming to better understand carbon stocks and sequestration rates in three types of coast environments: mangroves, salt marsh and seagrass meadows in South Australia.

#### Adelaide's seagrass meadows

Seagrasses provide important coastal marine eco-system services, sequestering blue carbon, providing habitat for many species including fish nurseries, and improving water quality. Eleven seagrass species live in South Australia's coastal region covering approximately 9,620 km<sup>2</sup>. When dead seagrasses come ashore as wracks during storms and high tides, they help prevent coastal erosion and provide protection for coastal infrastructure against sea level rise

Extensive seagrass meadows off Adelaide's suburban beaches were harmed by decades of pollution from industrial chemicals and general rubbish flowing into Gulf St Vincent via river outflows. The loss of seagrasses increases water turbidity, reducing fish and crab stocks and other important species, and increases beach erosion as seagrasses in the water column dissipates the energy of breaking waves. Water quality outflows to the Gulf improved when trash racks were installed along waterways and legislation passed banning chemical waste disposal into drains. The largest seagrass restoration project in Australia (supported by a \$1m grant) aims to re-establish around 10 hectares of seagrasses off the Adelaide metropolitan coastline in Gulf St Vincent. This is an example of large-scale rewilding to increase biodiversity and blue carbon.

Twenty years of research and trials by the Department of Primary Industries and Regions South Australia (PIRSA) has led to an efficient method of seeding large seagrass areas. Dr Jason Tanner, PIRSA explained: "This involves dropping around 100,000 biodegradable hessian sandbags on the seafloor over winter, and allowing wire weed seagrass seedlings (*Amphibolis antarctica*) to naturally attach to them." Hessian bags will be placed at up to 15 sites off the Adelaide metropolitan coast later this year [2019]. The existing seagrass meadows will release young seagrass, which move through the water and attach to the hessian bags." This project also involves Citizen Science, calling for volunteers to collect viable seeds from seagrass wracks for growing seedlings.<sup>8,9</sup>

#### South Australia's oyster reefs

Another very important coastal remediation initiative is restoring South Australia's lost oyster reefs. Oyster reefs have been wiped out through the mining of shells for concrete and fertiliser production, overfishing, dredging, water pollution and disease. In 1889 oyster reefs covered 1500 km of coastline but there is no longer a native oyster reef in South Australia.

Oysters are the kidneys of the oceans, each oyster filtering more than 100 litres of water daily removing toxins and improving water quality (which also assists in seagrass growth and viability). Oysters sequester blue carbon through the formation of shells eventually forming reefs, which also reduce coastal erosion. Oyster reefs improve fish stocks as they provide breeding habitats for fish and nurseries where young fish can shelter and grow.

Adelaide has built the largest artificial reef in the southern hemisphere off Ardrossan, York Peninsula. Known by a Narungga word, Windara Reef covers 20 hectares. A smaller 2 ha reef has been built 1 km off Glenelg Beach. In a talk to the Adelaide Field Geology Club in June 2020, Dr Dominic McAffee, University of Adelaide said "Windara Reef was an incredibly ambitious project as it is hard to restore reefs, but SA has done it".

About 160 purpose-built concrete structures of limestone and oyster-shells were placed just off the coast at Ardrossan (later rocks were added) and the structure was then seeded with 7 million live native Australian Flat Oyster juveniles (*Ostrea angasi*) grown in South Australian hatcheries. The baby oysters start producing spat (offspring) when they are three years old, which helps to create a self-sustaining reef. Findings are that the habitat around the Windara Reef has improved very rapidly.

#### **Carbon in landscapes**

South Australia has extensive land and woodlands relative to population and this presents a huge opportunity for capturing and storing immense amounts of carbon in landscapes through plants and soil. There is also an opportunity for the production of biomass as a renewable energy source, especially for use in chemical plants and energy intensive processes as well as for transport fuels. Professor Ross Garnaut says unproductive agricultural land in South Australia around the Riverland and Sunraysia regions on the River Murray straddling the South Australia/Victoria border would be suitable for the production of biomass. Importantly, the region will have abundant low cost renewable energy available for processing the biomass into fuels.<sup>10</sup>

Reduction in the state's deforestation rates and state government initiatives in afforestation and reforestation such as the Native Vegetation Heritage Agreement program and the expansion and enhancement of the protected area network have contributed to increased carbon capture in the South Australian landscape (contributing as negative emissions).

#### Agricultural Sector

Contributing 23% to total net state emissions, the agriculture sector's emissions are from the livestock industries, agricultural soils, and fertilisers. Market conditions and seasonal climatic conditions such as drought also affect annual emissions. **Regenerative agriculture** offers a way to reduce emissions from fertiliser use while regenerating soils and storing carbon in soils. Regenerative ways of farming enhance biodiversity, greatly improve the water cycle thus cooling the climate, provide soil protection through all year round plant cover, increase soil biota, reduce salinity, improve farm productivity, and improve the health of farmed animals and humans consuming the produce.<sup>11</sup>

"The South Australian Government Climate Change Action Plan 2021-2025" aims to support the agriculture sector to adapt, innovate, and reduce net emissions. Universities are researching ways ensure secure, climate resilient regional and urban water supplies and build the climate resilience of landscapes, habitats and natural resources. The 'Regenerative Agriculture Program', Landcare Eyre Peninsula offers Soil Carbon Demonstration Grants to farmers on Eyre Peninsula. Commencing in 2018, twenty two long-term trials are underway.<sup>12</sup>

The Federal government is funding more than \$3bn to support agricultural methane reduction, clean tech initiatives and commercialisation of seaweed supplementation for cattle (cows love seaweed) in a goal to cut methane emissions by 30% by 2030 although this is a global goal not a National goal. South Australia can benefit from the Federal funding.

Globally there is already a strong move towards regenerative agriculture and USA is leading the way. Interestingly, a network of global CEO's established by King Charles III has released a report 'Scaling Regenerative Action Plan' to be presented at COP 27 taking place in Egypt, 6 - 18 November, 2022. Signed by Bayer, Mars, McCain Foods, McDonald's, Mondelez, Olam, PepsiCo, Waitrose, Indigo Agriculture and others, the report states that "regenerative farming needs to scale three times faster to address the threat to a resilient and sustainable food supply presented by climate change and biodiversity loss." One hopes that these businesses are really supporting this initiative, and it's not the "fox in charge of the hen house" as Colin Seis commented on hearing about the report. However it is encouraging that regenerative farming will be on the Agenda at COP 27. <sup>13</sup>

Colin Seis' regenerative farming property 'Winona' in NSW was discussed in an article printed in SEGments.<sup>11</sup> Colin's property averaged 4.42 tonnes per hectare per annum of soil carbon under his regenerative agriculture plan, storing 15.56 tonnes  $CO_2$  equivalent per ha per annum. Raised in a multispecies crop under rotational grazing, Winona's lambs yielded twice the weight with double the profit of lambs raised in a barley crop alone.

#### Sequestering carbon in landscapes in pastoral areas

Of interest to SEG readers there is a small native vegetation plantation in the Northern Ikara Flinders Ranges on a pastoral property that SEG visits for the V-GRaSP long-term rainfall study. Native seeds are gathered from the previous year's plantings and the plants are watered using bore water. The fenced off area of several hectares will be increased each year.

#### Green hydrogen

Hydrogen, like electricity, has to be made as there is very little free hydrogen anywhere on earth. Hydrogen can be

extracted from gas, oil or coal, or by using electricity, directly from water. 'Green' hydrogen made using renewable electricity is  $CO_2$  free, producing only water, oxygen and hydrogen.

Hydrogen gas can be stored and importantly converted to electricity to help meet the state's energy requirements when other sources of renewable energy are limited. Hydrogen can be used as a transport fuel in fuel cells and transported in tanks to locations away from the production site. It can be converted to ammonia for transporting in volume and for manufacturing 'green' fertiliser.

Ahead of the game again South Australia built Australia's first 'green' hydrogen production facility, HyP SA at Tonsley Innovation District. Using 100% renewable energy for the electrolysis process the HyP SA plant produced its first green hydrogen in 2020. Seven hundred homes in nearby Mitchell Park have been receiving a mix of 5% hydrogen and natural gas since May 2021.

South Australia has advertised a tender for the development of a publicly-owned \$593m, hydrogen hub at Port Bonython 16 km from Whyalla, aimed at getting producers, users and exporters in the same place. A 200MW hydrogen power station, 250MWe hydrogen electrolyser facility and 3,600 tonne hydrogen storage facility will be built. Significantly, hydrogen can boost the State's economy by being exported to other states for firming their grids and to other countries with more expensive energy options. Green hydrogen projects will support both South Australia's economy and the environment.<sup>5</sup>

#### Transport

Professor Ross Garnaut advises that in the mid-2020s the capital cost of electric vehicles (EV) will fall below the capital costs of internal combustion vehicles. "The EV lasts longer, has lower maintenance costs and uses less energy and a cheaper form of energy (electricity, which can become renewable energy produced at home)". Garnaut believes that advanced car manufacturers will not continue to produce cars with



Native vegetation plantation in northern Ikara Flinders Ranges showing three year's growth and surrounded by barren ground. Photo: Chris Wright

follow the rest of the world into the electrification of transport".14

The state government's policy is that by 2035 it wants all new passenger vehicles sold in South Australia to be fully electric. The RAA has a contract to install 530 EV charging stations in 140 locations across the state; more than three quarters will be in regional South Australia. A recent survey by the RAA reported: "62% members are considering an EV as their next vehicle. However, the main reason they weren't following through with a purchase was a lack of charging infrastructure."15

Herbert Giradet made many recommendations for lowering carbon emissions from Adelaide's high car use. Giradet noted that 'congestion is an economic and environmental cost; one bus can replace 40 cars, lowering the need for additional costly road space." The Rann and Weatherill government's followed through on many of Girard's recommendations, but continued to build road infrastructure. Of significance, under the Rann/Weatherill government's 30 year plan for Adelaide there was a proposal for a major expansion to the city tram network, known as AdeLINK light rail, for extending tram lines into all of the inner suburbs of Adelaide: south, north, east and west. Perhaps with Federal government support this important proposal to lower the state's transport emissions will be back on the table.<sup>16</sup> Lowering emissions from heavy transport will rely on electrification, hydrogen fuel cells and fuels from biomass.

#### **Fugitive emissions**

In the absence since 2014 of an Australian emissions reduction policy (when the Emissions Trading Scheme ended) Australia's emissions released from coal, gas and oil mining and processing (not including use as energy) have grown by over 37%, with the expansion of coalmining and gas fields.

South Australia, while reducing its use of fossil gas for electricity has 10% of its CO<sub>2</sub> emissions derived from so-called fugitive emissions from the processing and transport of gas at Moomba. The Cooper Basin gas fields owned by Santos and Beach Energy have over many decades supplied Australian households and industries with refined natural gas (mostly comprising methane) processed from unrefined natural gas. The refining process vents about 1.7m tonnes CO<sub>2</sub> annually to the atmosphere.

In December 2020 Santos announced its ambitious new emissions reduction target, including being net-zero by 2040. Talking since 2006 about carbon capture and storage (CCS) Santos' Chief Executive is now convinced that "a \$210m operation at Moomba starting in 2024 can drive a lucrative global CO<sub>2</sub> business storing up to 20 m tonnes a year". Over decades CCS technology has failed to live up to its promise, however Dr Alun Finkel says "while it won't be easy ... the geological conditions near Moomba for the CCS project are appropriate ... the carbon dioxide is already there and they have sites to bury it in". The sites are in depleted gas

internal combustion engines for Australia, "so we are bound to reservoirs approximately 50 km east of the Moomba Plant CCS Facility in the Marabooka and Strzelecki gas fields.<sup>17</sup> Safe CO<sub>2</sub> transport through 50km of pipeline will require sophisticated engineering.

> To keep the emissions balance neutral CCS processing will require renewable electricity. Leaking pipelines to domestic sites are an issue not addressed in the Chief Executive's briefing. The South Australian pipeline alone covers 1184 km. The Chief Executive for Santos hopes to make 'blue' hydrogen from methane in the future.

It will be important to reduce fugitive emission substantially if South Australia is to reach net zero by 2050. Commonwealth regulatory intervention can move Santos in this direction through the safeguard mechanisms of the Emissions Reduction Fund.<sup>18</sup>

#### **Built environment**

South Australia has a long way to go to improve the carbon footprint of its built environment. Few commercial buildings have a five star environmental rating. White roofs on new buildings can offset the heat effect from higher density housing and less green space, but building code standards are a Federal government responsibility. Other environmentally efficient types of roof may be 'green'. A study done by the University of South Australia and Flinders University showed that a covering of 30% vegetation would reduce electricity consumption by 2.56 W/m<sup>2</sup>/day, and even solar panels have a cooling effect.<sup>19</sup>

#### Personal carbon footprint

In a SEGments Editorial I wrote "some Australian families have little concept of reducing their carbon footprint as was made clear in the ABC TV series "Fight for Planet A: Our Climate Challenge" featuring Craig Reucassel". The inefficiencies of draughty houses, inefficient lighting, fuelguzzling cars, high-flow shower heads, and food and transport choices seem to surprise the families featured in the documentary.

Reucassel estimates that if the 8.2 million households in Australia made similar changes as his guest families (behavioural, transport, food choices, etc.) the result could be a 15% reduction of Australia's carbon emissions. Translating to South Australia this may remove the 10% that Finkel says may be hard to remove in getting to net zero.

#### Avoiding positive feedback systems

Achieving the "net" zero goal requires reducing to an absolute minimum those fossil emissions that South Australia is currently emitting, but of more critical importance as a good citizen of the world is to help lower global CO<sub>2</sub> levels already in the atmosphere and growing exponentially. We urgently need to avoid the earth's positive feedback systems: reducing the ice 'albedo effect'; the warming oceans becoming less suitable for algae growth thus reducing the rate of pump down of CO<sub>2</sub> and reducing the generation of white reflecting marine stratus clouds; on land increasing temperatures destabilizing tropical forests and reducing their area; as forest and algal ecosystems

die their decomposition releasing carbon dioxide acting in a warming world as a positive feedback; large deposits of methane held in ice crystals as clathrates (which are stable in the cold conditions or under high pressure) being released; wildfires releasing CO<sub>2</sub> and rising into the stratosphere with unknown consequences.<sup>20</sup>

Perhaps the University of Adelaide's 'Centre for Space Resources' should turn their attention away from interplanetary space research and instead investigate the use of sun shields in space to lower the earth's temperature.

#### The last words

On this important quest to cool our planet I leave the last words to our Scientific Expedition Group Elder John Love, who wrote in an Editorial worth revisiting (SEGments Vol 33, No. 1. June 2019).

"We evolved in a world where we have to strive to live, in harmony and in conflict with land, sea and air, with other species, with other members of our own species and within ourselves.

Sometimes we get it right and sometimes we don't. So we go on accumulating small pieces of information which become part of a growing body of knowledge which might or might not be directly beneficial to our generation. This is pure science."

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## Witchelina Expedition

As many members already know SEG was to be carrying out a biological survey on Nature Foundation's Witchelina Reserve in late October and early November this year. Unfortunately more wet weather intervened and many roads to and within Witchelina became impassable. Within three days of the proposed departure date the expedition was postponed.

It is now proposed that the expedition be carried out in Autumn 2023. Dates have not been finalised but will be as soon as possible.

If you are interested please send an email as soon as possible with your details to the SEG email scientificexpeditiongroup@gmail.com and we can inform you as plans are developed.



# BOOK REVIEW BY RICHARD WILLING

From one small seed – a forest is born

## **Restoring Australian Landscapes from coast to coast**

For a nature lover, opening this splendid book for the first time is quite an exciting experience!

Neville Bonney, the great teacher and communicator, has spent a lifetime of learning and teaching us about our environment, its destruction and methods for its repair. The best known of his more than 20 books is *What Seed is that?*, written three decades ago and revised in 2003. It is a handbook for those wanting to collect seeds for revegetation – seeds which grow into trees and shrubs. Book topics include "bush tucker" plants such as native neach, quandong (Santalum acuminatum), growing them in plantations. Other

germination, storage, preparation, the importance of pretreatment, viability and dispersers. Then follows almost 600 pages of plant descriptions split up into families, then genera, then about 750 species, half a page per plant with sharply defined photographs of mature plants and seeds, their distribution, methods of dispersal, derivation of scientific names, common names, description of usual habitat and visitors such as birds and insects. It often goes further and includes notes about the complex relationships between soil, fungi, flowers, pollinators, plant communities and other ecosystems. This is not an exhaustive list of Australian native

edible wild native plants, books are about acacias, sheoaks and plants of the Flinders Ranges and Coorong regions. He also has practical experience of revegetating nearly 1000 sites in southern Australia.

The focus of From one small seed - a forest is born (FOSS) is restoration of Australian landscapes. Under one cover It gathers together information such as saving remnant vegetation, revegetation and regreening, the management of native vegetation by fire by First Nations people, the rate of regeneration of various species after bushfire, the rapid and indiscriminate clearing of native vegetation for agriculture after World War 2, and the subsequent loss of habitat and threatened



extinction of species. Bonney has published extensively about these topics since his early days. Armed with his own vast botanical knowledge Neville has gathered expertise from eleven authors (the FOSS Advisory Group), various plant and botanical groups, and First Nations elders who contribute their expertise in various fields. Much of the beautiful photography, from plant details to rolling vistas was done by Greg Coote, Frank Prinz, and Neville himself.

The early pages deal with topics such as a Chronological Overview of Changing Australian Landscapes, Healthy Bushland needs Fungi and Pollinators, then 20 pages of information about seeds – types, First Nations connections, plants, rather those that are more readily available for seed collection and propagation. Most plant groups and landscapes represented are found in the temperate and arid regions of Australia, from east to west. Those with tropical distribution are included if also found down south.

In his new book we have a master craftsman distilling his life's work into a magnificent, iconic publication. As the author says, his book is user-friendly, and an educational tool. Picking it up and opening randomly it is very easy to find that an hour has elapsed while browsing in it. It is not a field guide, weighing 2.8 kg, but a valuable resource to be had in one's library, whether to look things up, or to browse while enjoying the elegant way that information is presented. Neville's hope is that it will

continue to inspire others well into this century. This elegant book is a "must have" for all native plant lovers and those dedicated workers in the field of revegetation and greening of the Australian environment.

rwilling01@gmail.com <u>Publication Details</u> From one small seed – a forest is born Restoring Australian Landscapes from Coast to Coast Neville Bonney Openbook Howden, ISBN 987-0-6483900-3-9. 651 pp,

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## CHAIRMAN'S REPORT 2022 AND REPORT ON THE AGM

## **Bob Sharrad**

I have been surprised and rather chuffed, on reviewing this year's activities, to see how much we have done and have planned for the future.

Our long-term projects continue:

• The enthusiastic volunteers in the **Vulkathunha Gammon Ranges Scientific Project** (V-GRaSP) have travelled to this remote area again this year to service the measuring devices and to assess the vegetation. Graham Blair, Chris Wright, John Love inspire with their sagacious leadership and dedicated, keen workers such as the Gary and Michelle Trethewey and Phil and Janet Davill lend their support.

• The **Minnawarra project**, lead by Richard Willing and Janet Furler carried out its autumn and spring surveys adding more data to the impressive load accumulated over more than two decades. One of their challenges, apart from continuing to attract volunteer helpers, is to source more Elliot Traps to replace our ancient specimens.

• Malleefowl monitoring took place again at Bakara CP, largely organised by Helen Owens, and a team also visited Danngali CP to help check ("ground-truth") LIDAR records for the area. Both visits were successful with active nesting mounds being found and adult birds seen.

**Science Alive:** thanks to stalwarts like Helen Johnson and Annette Vincent we successfully participated in this event again this year. As usual Annette's ants were a great hit with the school children.

**Communication: SEGments** remains one of the most interesting publications of its type thanks to Alun Thomas and, until recently, Helen Johnson. The **website** has also become a most useful means of communication thanks to the work of Michelle Trethewey and Michael Brown.

**South Australian Environment Awards:** we are all very pleased to see our former President and mentor Dr Richard Willing OAM receive a Lifetime Achiever Award this year.

#### **Certificates of Appreciation**

• Graeme Oats our long-term Treasurer has retired after decades of active, energetic service. It is hard to imagine meetings without him keeping us on track.

• Phil and Janet Davill for outstanding support and involvement.

• Annette Vincent for her work at Science Alive events and on field trips.

These awards were presented at our Annual General Meeting by our Patron Mr Rod Bunten.

**Witchelina survey:** at last we get back to the arid zone again late Octobber (but subsequently cancelled – Ed).

**Patron:** we are pleased to have a new patron, Mr Rod Bunten the husband of the Governor of South Australia, Her Excellency the Honourable Frances Adamson AC. None of the above could happen without the support of our members and particularly the committee:

Emeritus President: Richard Willing, President: Alun Thomas, Vice-Chairman: Duncan MacKenzie, Secretary: Michael Brown, Treasurer: Graeme Oats (retiring), Committee members: Trent Porter, John Love, Helen Owens, Jill Tugwell, Peter Reuter, Helen Johnson (retiring). Now we have a new Treasurer: Peter Whitehead.

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Annette Vincent receives her Certificate of Appreciation from our Patron



Phil Davill receives a Certificate of Appreciation on behalf of himself and Janet Davill



Graeme Oats receives his Certificate of Appreciation from our Patron

## SOUTH AUSTRALIA'S GLOBAL FUTURE

## **Helen Johnson**

In March 2022 I attended "South Australia's Global Future" at the University of Adelaide, held in Bonython Hall. The four eminent people on the podium had all received an education at the University of Adelaide before moving away to pursue their careers elsewhere in the world. All had now returned bringing extraordinary skills to make a contribution to South Australia's future.

The panellists were Her Excellency the Honourable Frances Adamson AC, Governor of South Australia, Professor Peter Høj AC, Vice Chancellor and President of the University of Adelaide, Mr Andrew Nunn, South Australia's Chief Entrepreneur and Ms Carolyn Hewson AO, business woman and Board Member CSL Ltd.

Many important points were made during the presentations. South Australia has already made the most extraordinary contribution all around the world. Cooperation works across government, parliament, business and universities, which is an important factor in driving technology. South Australia has a government appointed Chief Entrepreneur who can bring ideas together across these collaborating bodies.

Education is the backbone to all innovations and its translation to research is vital. Adelaide has three universities with associated research bodies, a surprising number for a middle-sized city. South Australia is gaining a reputation as an innovative city and young people are returning to make their careers in South Australia.

Shaping South Australia's future in the world is about <u>seizing opportunities</u>.

#### South Australia as a Superpower

Ross Garnaut predicts that the "early and orderly movement to zero-emissions electricity is the cornerstone of decarbonisation of the Australian economy. It is also the foundation for Australia's emergence as a superpower of the post-carbon world economy." <sup>1</sup>

South Australia with low-cost renewable electricity stabilized by batteries, coupled with the future availability of abundant green hydrogen and supported by a major investment in long-distance, high voltage transmission and demand management, is positioned to reap the rewards as a State superpower. Poised to once again become competitive in energy-intensive industries, including processing mineral ores onshore, the Upper Spencer Gulf region is leading the charge.

#### **Upper Spencer Gulf transition from fossil fuels**

Planning for the transition from fossil fuels to renewable energy began early in Port Augusta in anticipation of job losses as the coal-fired power plants closed. Even with forward planning, in May 2016 the closure of the last of the three plants occurred earlier than was expected. In 2018 the Port Augusta Mayor, Sam Johnson said Port Augusta is set to be the renewable energy capital of the country "with more ongoing jobs than at the former power plants if all the proposed projects in the Upper Spencer Gulf go ahead." Multiple renewable energy projects planned were worth \$1.75bn, including: "substantial investment in renewable energy generation, mining and mineral processing, arid agriculture, Defence, tourism, waste recycling and moving industries towards a circular economy." <sup>2, 3</sup>

# Renewable energy to power Upper Spencer Gulf 'green' industry

When completed in 2020 the **Bungala Solar Power Project** located 10 km north-east of Pt. Augusta was the largest solar farm in Australia, and also the largest in the southern hemisphere. The Bungala solar farm covers over 800 hectares (2000 acres). The land is owned by the Emeroo and Wami Kata Bungala Aboriginal Corporation, a community employment and social services organisation. Commenced in 2017 as a two stage project, Bungala reached full power in 2020. The farm has 420,000 solar collectors with a capacity of 220MW generating 570GWh per year; enough electricity to power about 82,000 households. It is owned by Italian multinational Enel Green Power and the Dutch Infrastructure Fund. <sup>4</sup>

Lincoln Gap Wind Farm has 59 wind turbines generating 212MW as well as a 10MW grid scale battery. Owned by Nexif, Stage 3 will add 256MW to the state's grid.

The \$3bn **Goyder Renewable Zone** has been announced for construction as Goyder South and Goyder North; south and north of Burra. Goyder South (in three stages) will be built first because of its proximity to the Robertstown 'big battery' substation. Neoen Australia, a subsidiary of the French renewable energy producer Neoen, has received approval for Goyder South stage 1. Goyder South will eventually generate 1.2GW wind, 600MW solar and 900MW of battery storage. Goyder North has not yet received approval and is dependent on the progress of the SA-NSW interconnector, due for completion in 2025.

The state government is serious about the planned 200MW green hydrogen plant at Port Bonython. Premier Malinauskas has said that Port Bonython has the potential to generate more than 1.5 million tonnes of hydrogen by 2030. At the '2022 SA Environmental Awards', when SEG's Emeritus President, Dr Richard Willing received a "Lifetime Achievement Award", the Premier said "South Australians will own the hydrogen plant". <sup>5</sup> Adding to the region's green hydrogen, the Nyrstar Pt. Pirie smelter is planning to build a plant to produce 100 tonnes per day at full capacity for local use and for export. <sup>6</sup>

With green hydrogen produced at Pt. Bonython and Pt. Pirie there will be a huge boost to South Australia's 'flexible/ baseline' renewable energy resources. The green hydrogen precincts will importantly support the decarbonisation of transport and industry within South Australia as well as benefitting local businesses. Of considerable importance, the state's economy will be boosted with the export of green hydrogen as green ammonia, supporting our major exporting countries with more expensive renewable energy resources.

### **Innovative Upper Spencer Gulf zero-emissions** industries

#### Nyrstar Port Pirie- an industrial success story

In 2019 Trafigura, the second biggest metals trading company in the world, bought 98% of the struggling Nyrstar Port Pirie smelter assuring 4,000 direct jobs and many more in the broader economy. The Nyrstar plant is one of the world's largest multi-metal smelters, producing lead, silver, sulphuric acid and copper cathode; all essential for the manufacture of everyday products. The smelter has been operating for more than 130 years.<sup>6</sup>

Responding to the required energy transition, Nyrstar is in the planning phase with the South Australian government to develop a commercial-scale green hydrogen production facility integrated into the metals recovery smelter. The plant will use 100% renewable energy to produce hydrogen through electrolysis.

The Nyrstar smelter has become the first accredited company under Australia's B-Cycle national battery recycling scheme. 88 million alkaline batteries (up to 2,000 tonnes) will be recycled annually, recovering the valuable and finite commercial grade zinc and copper and importantly keeping the waste out of landfill.<sup>7</sup>

#### Whyalla Hydrogen Hub and green steel

With the building of the Pt. Bonython green hydrogen hub, the troubled Whyalla steelworks will be an early producer in Australia of 'green steel'. Whyalla is poised to become a regional centre for hydrogen production, research, development, training and education.

#### Pt Lincoln green ammonia

In 2018, ThyssenKrupp announced they were moving forward with a demonstration plant to produce zero emissions 'green' ammonia using renewable energy from the Pt Lincoln, Lincoln Gap wind farm. Progress with the pilot plant cannot be ascertained.<sup>8</sup>

#### Arid agriculture - Sundrop hydroponic farm

Located south of Port Augusta the Sundrop hydroponic greenhouse is Australia's first arid horticulture operation, a world-first for innovation and a template that could be transferred to barren land across the world. The process used by Sundrop has decoupled food production from finite resources; fossil energy, soil and fresh water, and from the overuse of health-damaging fertilisers. Supplying exclusively to for funding news". Giles Parkinson, Renew Economy, 1 Coles supermarkets, Sundrop produces 350 tonnes of truss tomatoes weekly from 750,000 plants using solar thermal

energy and desalinated water on a site that was an unproductive cattle farm sustaining 5 cows per hectare.

A 127m tower concentrates sunlight from 23,000 mirrors turning sunlight into electricity used to desalinate sea water, heat the fresh water, and pump it through 60 km of pipes surrounding the tomato plants. Various salts from the desalination process are used as fertiliser in the greenhouse and for the production of sodium chloride, sold as common salt. Many of the 300 Sundrop employees previously worked at the Pt. Augusta power stations. The hydroponic greenhouse is an example of a new order in renewable energy projects and represents a circular economy.<sup>9</sup>

#### **Pumped hydro**

For nearly 3 years proposals for three South Australian pumped hydro projects in the Upper Spencer Gulf have been waiting for funding negotiations to be finalised by Australia's Renewable Energy Agency's (ARENA). The preferred option will receive a \$40m grant from the Underwriting New Generation Investment program (UNGI). Perhaps the new Federal government will hasten the process, further boosting South Australia's base-load renewable energy storage.<sup>10</sup>

#### Conclusion

The examples of industries discussed here are just a snapshot of the innovative 'green' industries which will burgeon across South Australia by 2030 and beyond. However, in transitioning early to a new economy, the Upper Spencer Gulf has swiftly moved South Australia towards its global future.

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## RECOLLECTIONS OF MATTHEW FLINDERS RE-ENACTMENT AND SEG 2002 Richard Willing

As an explorer, Matthew Flinders is much better known in Australia than in his native England. Here we find his name in streets, suburbs, the western end of Kangaroo Island, a university, a town, a railway station, mountain ranges and islands. That's not to mention the many places he named around coastal Australia.

In March 1802 he sailed up, and named, Spencer Gulf until he could go no further. He named a fine mountain to the east Mt. Brown after Robert Brown, the botanist in his party, then sent him and a small group of sailors to walk to it, climb it and collect botanical specimens. All objectives were achieved, but the walk in was much further than they expected, and the climb was quite steep. They had to stay overnight without any camping gear.

200 years later, to the day, this event was celebrated in Port Augusta, starting with a "long lunch" at the Yacht Club, looking out to two sailing ships, the Enterprise and One and All anchored in the gulf. The ascent of Mt. Brown was re-enacted with the Enterprise taking a small party to Chainman's Creek sailing at night for a 4.30 am landing among the mud and mangroves. The walk and ascent of Mt Brown was organised by Graeme Oats, SEG Treasurer. In the party were Laurie Haegi and Helen Smyth, botanists, John Zwar, director of the Arid Lands Botanic Garden in Port Augusta, Keryn Walsh, archaeogist, Paul Wainwright and Mark Darter, SEG members and bush walkers, Warren Bonython, president of SEG and conservationist, and Alun Thomas, SEG member, who also doubled as the bus driver, delivering various people to various drop-off spots. The guest of honour was Lisette Flinders-Petrie, a great-great grand-daughter of Matthew Flinders, and her teenage daughter Rachel Lewis. Both were jet-lagged having just flown from London. There were also some people from the Department of Environment who were holding an opening ceremony at Woolshed Flat for the new lookout on Mt Brown. Lisette attended this in spite of still being caked with mud from her early morning wading, later walking up the more gentle slope to the summit. Most people found it a tough day, with the early start, the long walk across the plain, and the steep climb, but all thought it worth the effort. Most agreed that the original party were pretty tough to do all that and collect hundreds of botanical specimens as well. Warren Bonython, aged 85, joined the party at the base of the mountain for the climb, and confided to me that he thought he was going to die on the way up. It was only temporary though. He lived another ten years after that.

To mark the bicentenary here was a very good display of Brown's botany at the Arid Lands Garden, emphasising what a successful trip that original ascent had been.

Two hundred years earlier Flinders sailed south and encountered the French Expedition led by Nicolas Baudin near the present town of Victor Harbor. Lisette's next engagement was there. She had been booked in at the VIP flats at Flinders University and expected to drive an hour each way, on 3 consecutive days, to the official Victor Harbor celebrations. Gwen and I offered accommodation at the farm at Minnawarra, only 20 minutes from Victor. Rachel came too. Victor was a big event, with a couple of sailing ships, many yachts and a French Navy frigate anchored near Granite Island.

Lisette and Rachel were tremendous guests, warm, interesting and enthusiastic. We enjoyed their company very much. I asked them to plant a tree to commemorate their visit. After discarding many different species I settled on *Flindersia australis*, also known as Crows Ash or Australian Teak. It commemorates the man, and his use of Australia as the name for this country. I could have been more practical in my choice, because it grows normally in old growth forest in semi-tropical NSW and Qld. After a few months it looked as though it was doing well, so I removed the tree guard. This allowed hares to come in and nearly ringbark it overnight, so the tree guard went back on. It is a slow grower, but it is still surviving in spite of the cold winters and dry summers of Myponga. It brings back happy memories.

As a matter of interest, Matthew Flinders' grave, previously lost, was identified a few years ago during excavations in Euston Station in London. He died in 1814 at the age of 40. After much discussion the plan was to take his remains back to the church in Donington, Lincolnshire, UK, where he grew up. I do not know if this has happened yet. In the church there is already a small statue and a stained glass window celebrating him.

Time has moved on, and several members mentioned above are no longer with us. Warren Bonython passed on in 2012, Gwen Willing in 2017, and Lisette Flinders Petrie in 2021. Rachel has married and has a son, Jacob Flinders Simmons, who would be about 5 years old now. As an old man, he could be interested in coming out to the 300 year celebrations!



Rachel and Lisette on the Enterprise

rwilling01@gmail.com

## SCIENTIFIC EXPEDITION GROUP INC. APPLICATION FOR MEMBERSHIP AND MEMBERSHIP RENEWAL for 2022 — 23

Membership is open to any persons, family or organisation interested in the following aims:

\* The promotion and running of expeditions of a scientific, cultural and adventurous nature.

\* The furthering of knowledge, understanding and appreciation of the natural environment.

\* Promotion of the values and philosophy of wilderness.

\* Enabling people to learn the skills required for planning and running expeditions, and to develop sound field techniques

### SUBSCRIPTION RATES

Adult member	\$40.00
Concession cards/ student	\$20.00
Family or Corporate membership	\$50.00

<u>HARD COPY SEGments</u>:- If you would like to receive a hard copy through Australia Post of our quarterly journal SEGments, please include in your payment an additional \$30.00 for a SEGments subscription. All members will receive an electronic copy by email.

Name	
Address	
Telephone (H)	(W)
E-mail	

Details of scientific, cultural, and adventuring or other relevant skill or interests you may be prepared to share with the group:

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#### **ELECTRONIC PAYMENT**

If you have access to the internet, payment can be made using SEG's bank account at Bank of South Australia, details as follows: Acc Name: Scientific Expedition Group Inc. BSB: 105-086 Acc No.: 330629440

Please use your last name if possible to identify your payment **AND** also advise us by email that you have made a payment to our bank account via email to – scientificexpeditiongroup@gmail.com Or send a cheque payable to Scientific Expedition Group Inc. with a photocopy of this page to:

The Secretary Scientific Expedition Group Inc. 111 Franklin St, Adelaide, SA 5000.

#### PLEASE NOTIFY ANY CHANGE OF POSTAL OR ELECTRONIC ADDRESS

