Evolution and significance of the regeneration reserve heritage landscape of Broken Hill: history, values and significance

David Jones
Abstract

In 1991, the National Trust of NSW classified the Regeneration Reserves surrounding the City of Broken Hill as an essential cultural heritage asset of the City of Broken Hill, and in 2015 the City of Broken Hill, including the reserves, were elevated to the National Heritage List under the Commonwealth’s Environment Protection and Biodiversity Conservation Act 1999. This tract of land, and its proponents, Albert and Margaret Morris, are recognised as pioneers of arid zone revegetation science in Australia; a point noted in the National Heritage List citation. They created at Broken Hill a unique revegetation ‘greenbelt’ of national ecological, landscape architectural and town planning significance. The Morris’ led the advancement of arid zone botanical investigation and taxonomic inquiry, propagation innovation, and revegetation science in the 1920s-40s in Australia and applied this spatially. Their research and practical applications, in crafting the regeneration reserves around Broken Hill, demonstrated the need for landscape harmonisation to occur to reduce erosion and dust damage to human and mining activities alike. This pioneering research and practice informs and underpins much arid zone mine reclamation and revegetation work in Australia today. This paper reviews the historical evolution of this cultural landscape, its integral importance to the cultural heritage and mining history of the City of Broken Hill, and its inclusion as part of the Broken Hill National Heritage List citation.

Figure 1. ‘The big red’ enveloping an elderly Mulga (Acacia aneura) specimen, photographed by Archit Patel, as published in Silverman (2009: 15).
Red dust storms and heritage

In October 2009, most of the eastern seaboard of Australia was awash with red. It encircled and enveloped Sydney causing visual chaos and front page news. Sydneysiders were amazed with the events as the ‘Red centre causes havoc in big city’ and ‘the big red’ descended upon a place that had long forgotten such an irregular climatic episode (Hohenboken & Dayton 2009: 1, 6; Christian & Hyde 2009: 1, 6-7; Keen 2009: 1, 3; Silverman 2009: 15).

But spare a thought for the stations and communities from Lake Eyre eastwards that bore the brunt of this red cloud that enveloped their landscapes, farms, and homes casting dense clouds of dust into every crack, crevice and hollow water vestige. While up to $30 million ‘pleas for dust storm relief’ were made, this climatic episode was historically very common in northern South Australia (SA) and western New South Wales (NSW), being far more pronounced in the 1910s-1940s period due to land degradation practices and extended drought (Berkovic 2009: 23; Akerman 2009: 5). As one correspondent in Coober Pedy wrote:

You call that a dust storm? Coober Pedy life hits city

Dust storms in Coober Pedy rarely make the headlines.

The one on Tuesday was a shocker—the longest dust storm in living memory, red desert sands delivering a stinging slap to the face from dawn until close to midnight as they picked up small pebbles from the opal-mined ground.

“When I saw it on the news in Sydney, I said ‘Oh my God I knew exactly what that is’,” Mr McLaren said. “I think there would have been a number of people in town who would have been slightly glad that Sydney had experienced what we go through fairly regularly, the kind of adversity that we deal with.

For once—our city cousins got a taste of it” (Akerman 2009: 5).

Welcome to the Outback. Welcome to a common occurrence in far western NSW that prompted an innovative town planning and landscape architectural precedent in Australia that today informs international arid zone botanical science and mine site reclamation and stabilisation works.

Dust storms were historically a menace at Broken Hill and impacted mining activities, casting a dark pall over the city. As a child walking home to ‘Uncle Bert’ Morris’ house from kindergarten in the 1930s, Barbara Briggs remembers ‘a dust storm… we clung to a wire fence while wind-blown sand stung our faces and we tried to keep grit and dust out of our eyes’ (Briggs 2009: np). Similarly, Mrs Mews recalled as a child:

Figure 2. The wind-eroded Broken Hill Common in 1936, CRML BFNC 92-7-38. Reproduced with the permission of the Barrier Field Naturalists’ Club (BFNC).
One afternoon as we sat in the schoolroom, a large storm blew up. Our teachers, aware of the severity of these dust storms, dismissed us early. On the way home, the sky turned red, the fine particles of dust whipped against my face and body and I was forced to cling to fences and feel my way home, as visibility was so poor. Arriving home, I found the house locked up, towels and rags were crammed under the doors and around windows. We all accepted that we were stranded until the storm subsided (Mews quoted in Denton 1988: 370).

Albert Morris, himself, expressed it more scientifically as:

Erosion—wind erosion—is what we will have to fight if we are to put our new Broken Hill works where they should go; the position is open to the south and west winds, which pile the sand over every fence and low building in the area. How can the new works be protected? (Morris 1938: 43).

West of the Darling, and beyond

The cultural landscape of Broken Hill exists because of mining. It’s massive silver, lead and zinc orebody, discovered in 1883, is the reason for its existence. This is the place where both BHP Billiton (BHP [Broken Hill Proprietary Limited]) and Rio Tinto originated, of which the Zinc Corporation (ZC) was a predecessor of the latter. Historically, a ‘syndicate of seven’ pastoral station workers led by Charles Rasp pegged a mining claim in 1883, listing Broken Hill Proprietary Co. Ltd. on the Melbourne stock-exchange in 1885. The city grew to a population just over 30,000 residents by 1907 with 9,000 employed directly by numerous mining companies. By 2000 some 170 million tonnes of high grade ore had been extracted from ‘The Line of Lode’. Today there are two companies extracting ore, one at the south end and one in the centre of the lode (Anon 1948: 7-12, 65-76; 1955; 1960; 2009: 8; Trengove 1975; Hall 1972: 193; Koenig 1-15). They employ approximately 500 people.

This mineral extraction was not without its hardships, but a significant innovation was the work by Albert Morris (1886-1939) in conjunction with his wife Margaret (1882-1957), in pioneering arid zone re-vegetation techniques and establishing the regeneration areas (Jones 2002: 417). These ‘Regeneration Reserves’, or in town planning language ‘green belts’, were gazetted in 1937. They collectively comprise some 1715 ha of land within the approximately 13 km² Willyama Common, surrounding Broken Hill; in reality this is a ‘park land’ or ‘green belt’.

The mining legacy has been extensively reviewed by Kearns (1973, 1982, 1987, 2000), Koenig (1983), Solomon (1988), Stokes (1983) but only Albert Morris (1923), Margaret Morris (1939a), Jones (2002, 2009), Denton (1988) and Webber (1992) have addressed the designed landscape created by the Morris’, with Lord (1948), Beadle (1948), Pidgeon and Ashby (1940), Hall (1972) giving scientific weight to the significance of the Morris’ contribution to botany and erosion control knowledge for western NSW.

The Municipality of Broken Hill, incorporated in 1882, lies in far west NSW, Australia within the Barrier Ranges. Located some 1160 km from Sydney and 511 km from Adelaide. ‘Broken Hill’ derives from nomenclature used by explorer Charles Sturt in 1844 when he described a series of hills on a distinct north-east to south-west alignment with visual breaks in them. The main ‘broken hill’ has today disappeared due to mining activity.

Climate determines life and mining at Broken Hill. The place, in the Bulali country of the Wilyakali people, lies 220 m above sea level, and receives a mean average rainfall of 236 mm (91-447 mm) with summer temperatures regularly reaching 40°C. The summer period of November-March, the hottest time of the year, hosts an average is 32°C with a humidity of 25%. Over the same period, the evaporation rate is 2800-3200 mm per annum, strong winds come from the west and south-west. Both are climatic constraints upon humans working in this locality.

The grassland and Saltbush Downs landscape is characterised by grasslands of Variable Speargrass (*Stipa variabilis*) in association with Barley Grass (*Critesium murinum*), *Stipa* sp., *Panicum* sp., Mulga Grass (*Thryridolepis mitchelliana*), Windmill Grass (*Chloris truncata*), Kerosene Grass
(Aristida contorta), Tragus sp., Bromus sp., and introduced Barley Grass (Astrebla pectinata Turanti) that prior to mining would have been interspersed with clusters of Mulga (Acacia aneura) and Wilga (Geijera parviflora), with minor patches of White Cypress Pine (Callitris glaucophylla) and Belah or Black Oak (Casuarina pauper) accompanied by Dead Finish (Acacia tetragonophylla), and Nelia (Acacia loderi) with Eremophila sp., Myoporum sp., Black Bluebush Maireana pyramidata, Feathery Senecio (Senecio anethifolius), Dodonaea sp. and Olearia sp. (Morris 1975b: 8-13; Cowling 2007).

The miners needed water to service their thirst and the mining equipment and ore processing activities. Drought bedevilled Broken Hill. Household tanks, wells and soaks provided substitutes until a public supply was piped from Stephen’s Creek in 1890 before the Umberumberka Reservoir resolved much of this problem supplemented by a pipeline from the Darling River via the Medindee Lakes scheme (Koenig 1983: 27-28; Hall 1972: 192-193; Hardy 1968).

In addition, miners needed timber to generate energy to operate machinery and to prop up shafts. Shifting from open stope methods to excavation resulted in a demand for local gum, box and Mulga to support roofs and walls. The immediate result over the early 1880s was the complete de-afforestation of the landscape, necessitating the extensive importation of Oregon timber from Sydney before the cross-cut method was applied from c.1900 using Australian hardwoods (Hall 1972: 192-193; Koenig 1983: 15-16, 33-34; Webber: 12-20).

**Albert and Margaret Morris**

The Morris family shifted from Bridgewater, SA, to Thackaringa near Broken Hill in c.1876 when Albert was a child to work on the Lady Brassey Mine. At Thackaringa, Albert injured his left foot, crippling him and preventing him from playing with fellow children. This handicap focused his interest upon nature study at an early age, spurred on by his father who was ‘also an enthusiastic botanist’ (Morris M 1975: 1).

Schooled in Broken Hill, Albert obtained a diploma in metallurgy rising to be Chief Assayer to the Sulphide Corporation that was later acquired by ZC (Morris 1939b: 23). During the 1902 Broken Hill mining strike, Albert propagated and sold Pepper Tree (Schinus molle) seedlings, together with selling papers as income to support his college tuition fees. The former was no easy task. He had to creatively save family bath water to service the seedlings as water cost 10-15 shillings per 200 gallons (909 L) at the time (Morris M 1975: 1).
In 1919, Albert married Margaret, a staunch member of the Society of Friends (Quakers) (Webber 1992: 41-42). In Cornish Street, Railway Town, Broken Hill, the couple constructed a '5 wood and iron rooms' house with adjoining 'wood and iron shop and motor shed' on land owned by his father. There they developed an extensive arid garden full of succulents and other arid species that the two sought to trial, seed, graft and/or propagate (City of Broken Hill 1935, 35/454, 35/455, 35/456; Morris M 1975: 1-2; Webber 1992: 37-38, 42-43).

He started with a very small wooden shade house on the dusty block … [and] used to bring in small pieces of geranium and shrubs of all sorts; and from that has developed, still on the old dust covered block, one of the best known botanical selections of plants from the interior of Australia … [There] was an expanse of jam tins, each with a seedling of a native plant … At times, Bert would pay children to bring all the containers they could find for his growing plants (Morris M 1975: 1-2).

Located on the western extremity of Broken Hill, the residence and garden were directly exposed to the dry westerly winds that brought sand particles and dust storms. The latter often buried fences and gardens piling against stone house walls necessitating shovelling following a storm. The Morris family progressively erected a high random rubble sandstone wall on the western flank, increasing its height following each storm, until it was up to 3.3 m high. This experiment demonstrated correctly, that if a wall was high enough the back draft of wind would keep it clear of sand similar, to a pastoral shelterbelt (Morris M 1975: 1-2; Webber 1992: 37-38).

These experiments proved that wind shelter was essential and that plants could be successfully propagated and grown with limited water if the right species were selected. These lessons remained in Albert’s mind. Morris started experimenting with plant species; first with Australian native trees and shrubs, and then with African aloes and American cacti, characteristic of desert gardens today, but of which little was well-known elsewhere in the 1910s-30s in Australia (Morris M 1975: 2; Webber 1992: 40).

Following seedling and propagation trials in his own garden Morris concluded that local provenance species, from seed collected locally, were often the most resilient and successful species, although exotic species like the semi-arid Tamarix (Tamarix sp.), Pepper tree (Schinus molle) and Agave (Agave sp.) also proved resilient. The success of these trials brought confidence, and an eagerness to impart this knowledge with gifts of specimen plants and cuttings (Morris M 1975: 2).

Albert expressed this significant conclusion, in 1936, as:

My studies over many years have been mostly directed toward desert and semi-desert plant forms, both Australian and from other arid parts of the globe, and I am quite convinced that Australia has all the plants she needs to regenerate her dry places. It is necessary to select plants according to similar rainfalls and temperatures, soils and the like, and to take for our purpose only seeds from plants growing under arid conditions, in types of plants having a wide range. The propagation of native vegetation has many peculiarities, and, while studying such a wide field, the best methods for their propagation have not been overlooked (Morris 1938; 1975a: 43-50).

Morris had little scientific reference material to work with. While von Mueller (1858-82), Moore and Betch (1893) and Black (1922-29, 1943) had prepared compendiums of state-wide vegetation species, it was not until Prescott (1931), MacTaggart (1936) and Cameron (1935) that western NSW vegetation zone maps were prepared. The first publications about western NSW ecology and flora came from Collins (1923, 1924) for the Barrier and Grey Ranges, in association with inventory profiles by Cambage (1900a & b, 1901a & b, 1914, 1923), Cheel (1938), Haviland (1913) and then a major contribution by Morris (1923). During Morris’ time only five books relevant to NSW flora had been published, albeit with limited western NSW flora and ecology relevance (Turner 1891; Moore and Betch 1893; Maiden 1889; Breakwell 1923; Anderson 1934). Lord (1948: 368-369) recognised these deficiencies and credited Morris for advancing the knowledge and application of arid zone revegetation theory and practice, and Beadle (1948) and Hall (1972: 191-196) corroborated this advancement. Contemporary

To the Morris’, Broken Hill was a barren, isolated and neglected landscape devoid of vegetation. The visual barrenness was reinforced by the extensive removal of timber for mining purposes, and an over-grazed pastoral landscape collectively demonstrating over-stocking and mining deleterious effects. Despite being handicapped by physical infirmity, Albert, supported by Margaret, pursued local flora study travelling together thousands of kilometres in pursuit of botanical specimens for propagation and dispatch to herbariums across Australia. Albert acquired a small folding Kodak camera to photograph mounted and in situ specimens. His trademark Australian penny coin appeared in many black and white glass plate images as a scale device, images that he personally developed and printed, and which Margaret often tinted with watercolours for documentation enabling their use in public lectures (Mawby 1975: np; Morris 1975c: 8-13; Morris M 1975: 1-2).

These activities spurred the formation of the Barrier Field Naturalists’ Club (BFNC), on 20 February 1920, under the leadership of local doctor and passionate ornithologist, Dr William MacGillivray (1867-33). MacGillivray and Morris served as President and Honorary Secretary respectively until their deaths. From 1920-39 Morris delivered approximately 25 lectures, often with lantern slides, many of which were published or recorded as typescripts. He also organised many field trips for the Club (BFNC 1966, 1972; Morris 1975c: 8-13; Webber 1992: 52-53).

Planting Broken Hill

In about 1935, ZC Mine Manager, Maurice Mawby, a member of BFNC, recognised this expertise, and asked Albert: ‘Can we grow anything, and do you think it will help?’ Albert responded:

It will not only help, but will wholly remove the problem. There are a great number of trees and shrubs you can grow, and the grasses and sub-shrubby plants will come back after the first rain, providing you fence a fairly large area with stock and rabbit-proof fencing, and give some help for the first few years (Morris 1938; Morris M 1975: 43).

In a subsequent meeting with ZC Managing Director, William Robinson, Albert expressed a vision for the revegetation of extensive tracts around Broken Hill proposing the establishment of revegetation belts to reduce the impact of wind and dust. Mawby re-interpreted this vision as:

[T]he hope that something could be done to arrest the encroachment of drift sand on the habitations on the South and West Boundaries of the City—an area in which many millions of pounds would be spent in the years ahead to mine the deeper southward plunging mineralized Lead-Silver-Zinc Lodes (Mawby 1975: np).

This vision was introduced to incoming General Manager of ZC in Broken Hill, James Keast, in mid-1936. Keast enthusiastically saw merit in the vision and the benefits it offered to both mine production and quality of life in Broken Hill (Morris M 1975: 44; Webber 1992: 61-63).

Initially Albert expressed this ‘green belt’ concept as a ‘sanctuary’ recommending that ‘various plantations [be] declared sanctuaries’ (BFNC papers, 18 June 1937). Keast actioned this recommendation ensuring the gazettal of a By-law by the City of Broken Hill under the Public Trusts Act 1897 of NSW in 1937 ‘for Preservation of Native Flora’ on 412 ha of as ‘Reserve’ establishing laws protecting the native flora and establishing penalties for the despoliation of the Reserve. With gazettal, Albert was appointed a ‘ranger’ under the By-law (Keast to Morris, letter, 14 October 1936).

Margaret Morris wrote that Albert’s ‘chief dream was to establish a “Green Belt” round the town to stop erosion. To this end he had been working for many years, paying special attention to plants that would hold drift-sand and regenerate eroded areas’. Margaret used the term ‘belt’ in her 1939 obituary about Albert in the Barrier Miner. The term ‘green belt’ first appears in Margaret’s writings rather than Albert’s, and it was that undoubtedly the Adelaide Park
Lands ‘green belt’ that provided a theoretical model for what could occur at Broken Hill (Morris 1939b: 22; Morris M 1975: 3).

Freestone (1989: 31-32, 141, 146-149, 222) makes no mention of Broken Hill possessing a ‘green belt’ in his *Model Communities* in Australia. Within the town planning discipline, green belts have been viewed as a ‘green lung’, a ‘girdle,’ or a ‘ring’ of which Ebenezer Howard (1898) pointed to the Adelaide Park Lands as the ideal city model.

In May 1936 Keast approved the development of a plant nursery on ZC land, rabbit-proof fencing around the mine works, and an area of 8.9 ha south-west of the mine to establish Plantation No. 1. Albert used disused corrugated iron sheet fencing together with rabbit-proof fencing of 3.8 cm wire mesh affixed to vertical iron rail posts topped with strings of barbed wire to fence Plantation No. 1. A water tank, enabling gravity feed, was positioned at the highest point (Anon 1939: 27; Morris 1975a: 44).

Keast employed Morris to advise on plants and re-planting strategies in conjunction with mine expansion works that he was orchestrating. In the beginning, Albert grew all the seedlings in his garden, transplanting them into derelict jam tins, before transporting them to the Mine Nursery where they were re-planted into rectangular disused kerosene tins before being planted when they were about 300 cm high (Morris M 1975: 3).

Seeds from local trees and shrubs were grown, including Old-man Saltbush (*Atriplex nummularia*). For instant results, Albert transplanted some 1,600 previously-planted young *Eucalyptus* species from the Umberumberka Reservoir reserve, appropriately pruning their tips and roots, and re-planting them in disused kerosene tins in the nursery. From this experiment, he noted, that with the commencement of spring these pruned specimens produced ‘tiny red shoots from the dry looking sticks’ and that about 95% of them grew (Anon 1939: 27; Morris 1975a: 45; Webber 1992: 64).

The first plantings in Plantation No. 1 commenced in October 1936 including some 3,000 Old-man Saltbush in rows 0.9 m apart. The latter were used by Morris for wind protection and to delimit sand drift engulfling other seedlings as well as the regenerating Spear Grass (*Stipa variabilis*), Lobe-leaved Hopbush (*Dodonaea lobulata*), Silver Cassia (*Senna artemisiodes*) and *Eremophila* species The success of this initial experiment demonstrated to Keast was Albert’s vision that ‘if only we could get an area a mile wide [1.6km] fenced around the town to keep stock and rabbits off, to allow the natural vegetation to come back, we could stop sand drift’ (Morris 1975a: 46).

This planting strategy comprised:

Native seeds will be freely scattered in some paddocks, while others will be left to Nature alone, and these methods will supply valuable information in the campaign against sand. Bare patches on some of the worst abraded areas, where the top soil has been blown away, would be better if ploughed into furrows to hold drift sand and seeds. A little has been done and it is quite successful. It has been proved in many places. The furrows also hold the water and prevent run-off. Even without the rain, it is surprising how many plants have come up and are doing well [sic.] (Morris 1975a: 48, 51).

Over the summer of 1936-37, Morris worked on Plantation No. 1. Holes for some 3,000 tree seedlings were dug, and open drain-lines for water runoff control ploughed by a camel team. The drain lines, supplemented by a system of pipes, were connected to Broken Hill’s sewerage treatment plant which supplied undrinkable water for plant watering. On 9th January 1937 500 saltbushes were planted outside Plantation No. 1 enclosure, along with some 60 specimens of local provenance River Red Gum (*Eucalyptus camaldulensis*), staked, with no tree guards. Some 1,188 trees of 15 different species being planted by the end of the month. By about November 1936 the *Eucalyptus* species were recorded as being up to 4.5 m high with an average of 3 m, with the Black Oak or Belah (*Casuarina pauper*) showing very strong growth and Old-Man Salt-bush (*Atriplex nummularia*) growing to obscure some sections of the 1.8m high recycled corrugated iron fencing (Anon 1939: 26; Morris 1975a: 47-48; Webber 1992: 66-67).
All works and plantings were undertaken by ZC mine labour, under Morris’ direction. Webber concluded that ‘Robinson initiated the project, Morris provided the vision, Keast provided the plans and the material, and Scougall carried out the work’. Jack Scougall’s (b.1894), carpentry and rural upbringing was brought to bear in the erection of fencing. Posts and wiring was erected, with secure rabbit proof-wire attached by the men under his charge, and young trees planted under his supervision ensuring a meticulous operation much of which stands and grows today. At the same time Scougall became a competent self-taught botanist (Webber 1992: 50, 62-63).

At the end of 1937, Albert after being allocated seven additional paddocks for planting, had undertaken extensive ground preparation, and was waiting for the rains. The first six months of 1938 witnessed a mean annual rainfall of only 21cm of minor showers. In spite of this, Albert recorded that the fencing and removal of stock resulted in a ‘quite… noticeable difference in the amount of dust and sand’ in these paddocks as a result of native grass regeneration. Long moribund and grazed stumps of Mulga (*Acacia aneura*), Silver Cassia (*Senna artemisioides*), and Dead Finish (*Acacia tetragonophylla*) also regenerated in these paddocks.

Albert used some 18 species of *Eucalyptus* and 13 *Acacia* species to give ‘variety to prevent monotony’ consciously seeking to disguise the predominance of grey colours. Colour variation was added by *Myoporum* species many *Acacia* species and Salmon Gums (*Eucalyptus salmonophloia*), Bimble Boxes (*Eucalyptus populnea*), Giant Mallees (*Eucalyptus oleosa*) and Dundas Blackbutts (*Eucalyptus dundasii*). In late 1939, Margaret reported that, ‘in a botanical survey…this spring…there were 142 species noted’ (Morris M 1939b: 23). By 1944 Mawby reported that the original *Eucalyptus* species of 18 had grown to 86 recorded indigenous plant species in 1939 to 208 recorded indigenous plant species in 1944, and Pidgeon and Ashby (1940: 123-143) validated the success of the ‘regeneration [theory and practice] following protection from grazing’ (Anon 1944: 3).

The visual success of the ‘Zinc Corporation Plantation’ prompted Keast and Robinson to meet with mine managers from the neighbouring North Broken Hill and Broken Hill Proprietary South companies successfully seeking their support and involvement in the project. Land, approximately 0.8 km wide on the western and southern flanks of Broken Hill, some of the worst eroded areas, was fenced with rabbit-proof wire held on inverted railway posts to prevent rabbit and stock access, and were designated the ‘Regeneration Reserves’. The reserves were placed under Albert’s care. Historically these reserves had simply served as a series of agistment paddocks, long de-afforested by mining needs, and lacking any natural water. Albert immediately set about a establishing a regime to enable natural saltbush (*Chenopodium* species), grass and tree regeneration with through scattering and planting seeds and planting seedlings and young trees especially in depressions and along watercourses (Morris 1975a: 51; Morris M 1975: 3).

![Figure 5. The success of Morris’ regeneration activities as depicted in the Regeneration Plantation No. 8, Broken Hill, 1938. Photo: Albert and Margaret Morris, courtesy BFNC and CRML.](image-url)
Impact, legacy and heritage significance

Margaret Morris expressed this legacy as being:

This is the first town in Australia, and probably in the world, to attempt to improve the living conditions for a whole city by surrounding it with a belt of scrub to break the force of sand-drift and prevent houses and fences being buried with it (Morris M 1975: 23).

The first recognition of Morris’ work was in Ernest Lord’s influential *Shrubs and Trees for Australian Gardens* (1948: 367-377) who observed that Albert’s work was ‘Australia’s classic example of desert gardening and tree culture’. Lord summarised Albert’s experiments, complemented with numerous photographs, concluding that ‘the planting and management reflected great skill and care, such success seems largely due to the testing and selection of a considerable number of desert species, many of which had never been in cultivation before.’

Following the untimely death of Albert in 1939 from an inoperable brain tumour, Scougall was appointed ‘plantation foreman’ and ‘ranger’ and diligently continued the regeneration activities with direct assistance from Margaret Morris as ‘Botanical Adviser to the Plantation’. Scougall inherited a staff of eight men to assist in propagation, nursery management and planting (Anon 1939: 26, 27, 29; Webber 1992: 80).

A drinking fountain memorial today honours ‘Albert Morris—Nature’s friend’ and Plantation No. 1 is now known as ‘The Albert Morris Park’ edged with the Memorial Gates to Morris and Scougall unveiled by Margaret Morris on 21 August 1944 (Anon 1941: 46; 1944: 3). In 1966 the BFNC compiled a profile on Albert and his writings in *Plantlife of the West Darling* (1966; 1975).

In honour of Albert, several Australian arid-zone species record his botanical science contribution. These include the Slender Darling Pea (syn. *Swainsona Morrisiana* Black, now *Swainsona murrayana* ssp. *murrayana* Wawra), and a Saltbush (syn. *Morrisiella Morrisii* Aellen., now *Atriplex morrisii* RH Anderson) ‘named in honour of A Morris … who for many years has studied the flora of the Broken Hill district and who first collected this species and drew the attention of the [NSW] Herbarium staff to its distinctiveness’ (Anderson 1930: 505; Cunningham et al 1981: 271, 417; Jessop 1981: 187, 346; Morris 1975d: 66, 84, 98).

Mawby wrote in 1966:

Albert and Margaret Morris have laid the foundation—their work can be studied in the Broken Hill Area—and let us hope that their simple hobby with its spectacular results will be studied with increasing interest by trained scientists, pastoralists and town planners (Mawby 1975: np).
State and national significance

In 1991, the National Trust of NSW classified the Revegetation Areas surrounding the City of Broken Hill as comprising an essential cultural heritage asset of the City of Broken Hill. The Statement of Significance adopted is quoted in Table 1 below.

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<td>Statement of Significance: Broken Hill Regeneration Reserves, Landscape Conservation Area</td>
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1. The Broken Hill Regeneration Reserves (dating from 1936) are one of the earliest, major land-use initiatives in Australia aimed at combating land degradation.

2. The Reserves have importance in demonstrating an early and successful commitment to Australian environment enhancement largely based on the adaption of natural processes observed in the local Broken Hill area.

3. The city of Broken Hill is ringed by the Regeneration Reserves and these vegetated areas are held in high esteem by the community for their aesthetic qualities.

4. The Reserves exhibit the successful application of innovative regeneration techniques, radical for their time, but now commonly applied throughout Australia.

5. The Regeneration Reserves commemorate their founder, botanist Albert Morris who long campaigned for their establishment and who devised the various regeneration techniques based on his experimentations on establishing drought resistant plant species in the arid zone. The original twenty-two acre plantation on the Zinc Corporation Ltd land has been further developed as the Albert Morris Park in memory of his achievements in the field of land degradation control.

6. The Reserves constitute a very important teaching site for arid land restoration due to their long term establishment and relatively easy access from a major urban area.


In January 2015, the Commonwealth included the City of Broken Hill under section 324JJ of the Environment Protection and Biodiversity Conservation Act 1999 into the National Heritage List (Department of Environment 2015a: 1). Having regard to the recent call for submissions as to the prospective National Heritage listing of Broken Hill, the ‘regeneration reserves’ are a designed landscape positioned within the municipal boundaries of the City of Broken Hill the result of a conscious act of investigation and planning to construct a landscape with a clear set of objectives: ecological restoration, dust limitation and botanical enhancement.

References to the Morris’ in the Schedule attached to the Gazettal (Department of Environment 2015a) under the Environment Protection and Biodiversity Conservation Act 1999 are extracted in Table 2, of which the whole City of Broken Hill municipality was deemed as meeting Criterion a, b, c, f, g and h, and Figure 8 depicts the listed place land as a gazetted map that includes the whole City of Broken Hill municipality together with the Regeneration Reserves (Australia 2015b: 1).
Table 2
Extract of the Australian Heritage Council’s assessment criteria and conclusion citation as it relates to the Morris’ and the Regeneration Reserves (Department of Environment 2015a: 1-10)

City of Broken Hill:
About 16770ha, Silver City Highway and Barrier Highway, Broken Hill, comprising the whole of the Broken Hill City Council Local Government Area.

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| (a) the place has outstanding heritage value to the nation because of the place’s importance in the course, or pattern, of Australia’s natural or cultural history. | …

Other measures aimed at improving the amenity of the Broken Hill community came from the work undertaken by Albert Morris and applied by the Zinc Corporation. As a private individual, and with mining company support, he experimented by fencing and planting areas with native species and showed how regeneration of the denuded landscape could combat the impact of devastating dust storms. This far-sighted innovative regeneration work by Morris from 1936 led the Zinc Corporation to apply regeneration practices at Broken Hill. Subsequently the precedent was used by mining companies and spread throughout Australia, particularly in arid zones. Albert Morris pioneered research into the propagation and planting of native and exotic species that would grow in arid and semi-arid locations. He promoted ideas for ‘green belts’ in Broken Hill. Regeneration schemes, planted to protect Broken Hill from major dust storms, now partially surround the City and continue the intent of the program to revegetate the surrounding landscape degraded through removal of vegetation cover for mining operations and heavy grazing. The significance of Morris’ work is demonstrated by the plantations, the creation of popular recreational facilities and the extensive regeneration areas surrounding Broken Hill.

…

Broken Hill is a rare example of a mining town where ‘green belt’ regeneration measures were researched, tested and implemented. From the 1930s onwards with the assistance of mining companies, the revegetation of denuded areas adjacent to its urban areas was trialled and shown effective in reducing the adverse effect on dust storms. Albert Morris tested native and exotic species for their capacity to survive arid and semi-arid conditions.

…

Table continues over page.
f) the place has outstanding heritage value to the nation because of the place’s importance in demonstrating a high degree of creative or technical achievement at a particular period.

The work of Albert Morris, eventually supported by mine management, in researching, validating and subsequently implementing regeneration measures to protect both the residential and mining areas from devastating dust storms is a major technical achievement. His work, recognised nationally and internationally, is evident in the ‘green belt’ surrounding Broken Hill. Regeneration areas, following the principles established by Morris, now provide an edge to Broken Hill urban areas, particularly on the north-western and south-western boundaries.

h) the place has outstanding heritage value to the nation because of the place’s special association with the life or works of a person, or group of persons, of importance in Australia’s natural or cultural history.

The City of Broken Hill is important for its associations with many individuals who have played a prominent role in the Australian mining industry. Significant people include the lode’s discoverer, Charles Rasp; engineer and metallurgist GD Delprat; the American mining engineer Herbert Hoover; Australian industrialists WL Baillieu, WS Robinson and MAE Mawby, union organisers Percy Brookfield and Eugene O’Neill and environmentalist Albert Morris. As a group, the Barrier Industrial Council is also important for its association with Broken Hill.

Source: Department of Environment 2015a: 1-10.

Figure 8. Gazettal map associated with the City of Broken Hill National Heritage List inclusion. Source Australia 2015b.
This heritage curtilage envelopes Broken Hill and is expressed in several reserves, parks and gardens. It is Broken Hill’s equivalent to the Adelaide Park Lands and needs to be appreciated in this lens and spatial context (Department of Environment 2015c).

The endeavours of the Morris’ and their creation in the ‘Regeneration Reserves’ clearly fulfil Criterion a) and f) because the Morris’ were pioneers in Australian arid-zone restoration and regeneration activities and the reserves are a direct result of their technical accomplishment. Until the 1930s there had been minimal arid zone vegetation appraisal and restoration research or activity. Morris pioneered this realm. From his field research and observations, Albert Morris, in partnership with Margaret, concluded that species grown from seed collected from local provenance native flora withstood drought conditions better than introduced species. In testing and proving this theory initially on 9 ha of mine works land, he established the knowledge base that was later transferred to other arid zone mining and railway restoration projects including the Transcontinental Railway corridor project.

In addition, the Regeneration Reserves fulfil Criterion (h) because they have a special association to the life and work of Albert Morris. While the mining development and stature of Broken Hill can be attributed to its discoverers, miners, and mining bureaucrats, one tract of land integral to the place can be solely attributed to the role and activities of one individual, Albert Morris.

The recent National Heritage List inclusion of the City of Broken Hill, and specific references to the Morris’ and the Regeneration Reserves in the Criterion assessment, clearly validates the important national contribution the Morris’ made not only to Broken Hill but also the science of arid zone regeneration.

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