

# **Albert Morris and the Broken Hill regeneration area: time, landscape and renewal**

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By Peter J Ardill July, 2017<sup>i</sup>

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*The traditional occupation of their lands, dispossession and future of the Wilyakali People are acknowledged.*

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## *1. Introduction*

*The City of Broken Hill is now completely surrounded by areas specially reserved for regeneration of vegetation (Wetherell 1958)*

In a statement dated Wednesday, the 15<sup>th</sup> of October, 1958, the New South Wales Minister for Conservation, Ern Wetherell, announced the completion of the construction of the Broken Hill regeneration area (Wetherell 1958). The chief protagonist of the regeneration area project, Albert Morris, had died 19 years earlier, in January, 1939. He did live to see his dream of a series of regeneration reserves adjoining Broken Hill become a reality, and he knew that they would be a success. His knowledge of and regard for the arid landscapes of western NSW had guaranteed their success.

This essay presents a detailed chronological narrative of the events that led to the creation of the Broken Hill regeneration area. Albert Morris was determined to restore and conserve the eroded landscapes of far western New South Wales. He researched and experimented extensively with regeneration methodologies and had developed a defined technique of his own by the commencement of 1936.

In August 1936, Albert initiated negotiations which successfully culminated in the development of a plan to construct a series of regeneration reserves around the southern and western perimeters of Broken Hill. The fencing of this first set of reserves commenced in the spring of 1936 and was completed by February, 1937. Their construction represented the intentional application of a proven and systematic regeneration technique that created conditions for ecosystem recovery. They were not experimental.

These initial 1936-37 reserves of the Broken Hill regeneration area endured and were adjudged a success. Further reserves were added to the original area over the next twenty-one years and collectively they now comprise the Broken Hill regeneration area.

Albert enjoyed the support of a tremendous array of talented Broken Hill amateur naturalists. His ideas and plans were ably implemented by mining company administrators. The regeneration project met with success because it utilised a simple and for its time, pioneering regeneration technique: to allow a site's native vegetation to recover by excluding grazing stock and rabbits.

## 2. Degraded landscapes: 1900-1936

### *The landscape*

From time immemorial the Wilyakali people traditionally occupied the lands of the Broken Hill region, west of the Darling River (OEH 2017). Pastoralists commenced occupying these lands in c1860, and by c1870 commercial sheep and cattle stations were widespread. This rapid change in land use had a dramatic effect on the previously well vegetated and stable soils.

By 1900 significant expanses of the far western landscapes of NSW were in a seriously degraded condition. The grazing and foraging of commercial stock and rabbits and destruction of native vegetation were major contributing factors. The naturally low rainfall of approximately 250mm per year, frequent dry periods and hot summers impeded vegetation recovery. The result was widespread erosion (Beadle 1948 p.54). At a time of limited government services and resources, it was largely left to concerned local residents turned conservationists to study this situation and devise solutions.

### *Conservation pioneers*

Doctor William MacGillivray (1868-1933) was a Broken Hill medical practitioner and prominent Australian ornithologist (Embury 1933). He was disturbed by the native flora degradation and soil erosion that he encountered on his frequent country trips and campaigned for the implementation of conservation measures.

In 1903 he observed that the local saltbush only recovered from grazing when stock was fenced out of pasture areas. The Doctor recorded in 1908 that due to the cutting down of Mulga (*Acacia aneura*) and other scrub trees for stock fodder, paddocks were being “sacrificed” and destroyed for short-term gain (“Erosion West”, *Barrier Miner*, p.4, 25 February, 1937).

Interviewed by the Broken Hill based *Barrier Miner* newspaper in 1927, MacGillivray commented on the disappearance of Mulga and other trees and shrubs from the landscape, as sheep and rabbits were eating any new growth that appeared. He argued for the establishment of fenced protected areas that would allow the native vegetation to regenerate; it had flourished in the South racecourse enclosure in Broken Hill once the local stock was fenced out (“Rehabilitation Needed”, *Barrier Miner*, p.2, 26 September, 1927).

Albert Morris (1886-1939), a Broken Hill mining company senior assayer, was also interested in the flora and ecology of the landscapes of western New South Wales (Kennedy 1986; Morris, M. 1975. pp.1-3). In

1920 Albert and his wife Margaret Morris (1887 -1957) joined with *Dr Mac*, as he was known, and other Broken Hill residents to form the Barrier Field Naturalists Club. The Club provided Albert, Margaret, Dr Mac and other like-minded citizens with an institutional platform from which to campaign on a wide range of regional environmental, historical and cultural issues.

*Field trips, botany, ecology*

Albert and Margaret participated in the Club's botany excursions to various sites around Broken Hill and further afield. Albert combined field observations with home nursery experimentation to prepare an extensive set of notes and lectures on the subjects of botany, ecology and erosion.

These documents record Albert's developing interest in the causes of and possible solutions to the prevalent and widespread landscape degradation that existed west of the Darling River. Seed viability and dispersal, climate, the impacts of introduced animals, stock enclosure, weeds, soil function, ecology and flora succession, provenance and adaptability were all considerations that he successfully brought to bear on the development of the first regeneration reserves in 1936.

In an undated set of notes based on a trip to Mootwingee (now Mutawintji National Park), Albert commented on the presence of drift-sand in a dry season. The cause, he thought, was a lack of natural vegetation cover created by overstocking. Old Man Saltbush (*Atriplex nummularia*), for example, was not as common as it used to be, due to overstocking and possibly rabbits. He noted that grasses with a perennial rootstock, such as Stipa (*Austostipa spp.*), recovered speedily after rain. The weeds Mexican Poppy (*Argemone mexicana*), Night Lily (*Datura metel*) and Patterson's Curse (*Echium plantagineum*) did not escape his attention: "a fairly formidable array of nuisances" (Morris, A. n.d. 3, p.15, pp18-19, p.20).

*Wattles*, a 1921 lecture, offered advice on seed vitality: the local wattle Mulga could still be propagated from seed that was decades old (Morris, A. 1921a. p.124). On a visit to Cockburn, fifty kilometres west of Broken Hill, Albert observed the scarcity of small plants and attributed this to grazing by rabbits and stock including goats: "but inside the rabbit and stock proof enclosure of the railway annual plants flourish in great profusion" (Morris, A. 1921b. p.33).

*Flora Between the River Darling and Broken Hill*, an article prepared in 1923, illustrates Albert's developing interest in ecology. He presented a detailed description of the various plant communities of the region and their relationship with soil, climate, hydrology and aspect. The sand binding role of grasses was noted. Fungi, ferns, lichens, mistletoe and herb species were listed (Morris, A. 1923. pp.7-13).

The 1929 lecture entitled *How To Grow Gum Trees* stressed the importance of using "local trees" for planting, as they required very little water. "The beautiful Murray red gum" was commended as being suitable for a wide range of conditions (Morris, A. 1929. p.135).

In a 1936 Field Naturalists Club lecture Albert addressed the topic of *Ecology*. Explaining the ways in which plant communities vary due to differences in soil and water, he delivered the practical lesson to be learnt from these observations:

*Men are to be sent abroad to obtain plants to combat erosion. We need to be very careful before introducing fresh plants – our own did the work well, before the advent of white men, and could do it again, if given a chance* (“Our Plant Life”, *Barrier Miner*, p.4, 26 June, 1936).

Complementing this extensive field experience was the more conventional horticultural and botanical knowledge that the young and adult Albert acquired by study and experimentation in his own garden and nursery. He grew a wide range of Australian and exotic plants and developed propagation, seed collection, plant identification and nursery skills.

The Morris home in Cornish Street was constantly threatened by sand-drifts, and Albert conducted experiments there in order to evaluate the sand-binding capabilities of various plants. He concluded that Australian natives, particularly saltbush, were the most suited to erosion and sand-drift control work (Morris, M. 1939a. p.13).

Only a limited number of New South Wales flora and ecological reference books had been published at the time that Albert was developing his interest in matters botanical, and what was published often contained limited arid zone entries. Western New South Wales vegetation zone maps were not available until the nineteen-thirties (Jones 2016 p.45).

Despite this restricted range of resource material Albert developed an expert knowledge of the local flora. He taught himself and Margaret the principles of botany and developed an herbarium of over 7000 Australian and international specimens. His correspondence with prominent Australian and international botanists was extensive (Morris, M. 1939a. p.13). The highly regarded Albert Morris herbarium, undoubtedly collected and prepared with considerable input from Margaret, is now housed in the State Herbarium of South Australia.

Albert also developed an interest in urban landscaping projects. For example, in 1929, at the request of the Board of Management, he established a plantation of 800 trees at Broken Hill Hospital. The trees were propagated in his home nursery and the species were selected on the basis of their suitability to the soil and other conditions of the site. Margaret Morris and Miss Harris, the latter newly arrived as a teacher at Broken Hill High School and already Assistant Secretary of the Barrier Field Naturalists Club, also worked on this project (“Trees for Hospital”, *Barrier Miner*, p.2, 15 April, 1929).

This combination of field experience and observations, home experimentation and study and practical landscaping activities equipped Albert and Margaret with the essential skills that their later projects required. Miss Harris (Thistle Yolette Stead, 1902-1990) also graduated to further botanical and conservation exploits (Webb 2012).

*MacGillivray, Morris and Osborn*

A further likely and significant influence on the development of Albert's ideas relating to ecology and regeneration was his exposure to the work of Theodore Osborn. Professor Osborn ((1887-1973) was an academic botanist and ecologist who conducted pioneering field research into the effects of overgrazing and stock enclosure on plant and pasture regeneration at the University of Adelaide's Koonamore Vegetation Reserve from 1926 onwards (Anon. 2016; Robertson 1988). Osborn was particularly interested in the effects of overgrazing on saltbush and bluebush.

There is a strong possibility that Albert and Doctor W. MacGillivray had some form of connection with the Koonamore work. Albert had already developed a correspondence relationship with Osborn before the opening of the Koonamore Reserve, seeking plant identification advice from him (Morris, A. 1921b. p.39).

Albert was collecting flora at Boolcoomatta Station, South Australia, in 1926 and collected specimens at nearby Koonamore Station, which was adjacent to the Vegetation Reserve, at some time prior to October, 1927 (Morris, A. n.d.2. p. 84; Black 1927 p.381). Doctor W. MacGillivray knew of the Koonamore work and its scope via the journal of the Council of Scientific and Industrial Research ("The Dying Saltbush", *Barrier Miner*, p.2. January 3. 1928).

There is a high probability that Albert and Dr Mac visited the Koonamore research facility and observed the experimentation being conducted there. It is tempting to suspect that there were ongoing exchanges of field trial results and opinions between the three men.

Albert would definitely have been aware of the character of the research that was being done at the Reserve and that it overlapped with his interests. It would have been fortifying for him to have known that the fields of experimentation that he was developing were also being investigated by an academic researcher.

*Conservation*

Albert's studies and ideas were not confined to the theoretical and practical aspects of botany and ecology. The dramatic and expansive arid landscapes of western New South Wales were possessed of abundant and diverse indigenous flora and fauna and striking aesthetic qualities.

Albert's observations of these intrinsic qualities developed into a deep concern for their conservation:

*Let me add a plea that all possible measures be exerted to preserve for future generations the wonderful plants, birds and animals it is our privilege to see now, because Australia is unique as regards these things (Morris, A. n.d.3 p.22).*

After a September, 1921 trip to Mount Robe, Albert recorded that the climb to the top was heavy and difficult, but this hardship passed unnoticed because of the interest that he had in each plant encountered. The panorama was wonderful: “beautiful vistas of blue hills stretch away as far as the eye can see” (Morris, A. 1921c. p.26). In a 1924 lecture he referred to “the beauty we have at our own door.....the scenery of our own district has a beauty of its own” (Morris, A. 1924. p.129).

Albert observed Australian fauna closely. He was alarmed by the threats that it faced from introduced species and the pastoral industry.

Writing in 1923, he lamented the disappearance of mile-long flocks of Harlequin Pigeons (*Phaps histrionic*) from the plains, their habitat and food supply destroyed by sheep. He noted the detrimental impact of foxes on bird populations, including the Bush Curlew (*Burhinus grallarius*) and the Black Swan (*Cygnus atratus*) (Morris, A. “The Flora between the River Darling and Broken Hill” p.64 cited pp.35-37 in Environment NSW [2002]). The treatment of the majestic Wedge-tailed Eagle (*Aquila audax*) appalled him:

*This largest and finest of our raptorial birds kills a few lambs.....and in consequence is poisoned, trapped, and shot by the man on the land* (Morris. A. “The Flora between the River Darling and Broken Hill” p.64 cited p.35 in Environment NSW [2002]).

Albert, with his extensive knowledge of local ecosystems, was aware that he was witnessing the extinction of many fauna species:

*Some of the smaller marsupial mice are to be found by a zealous researcher, but will, before long, be gone forever. The causes of extinction of these species are to be found in the destruction of all natural shelter in the shape of underscrub and herbage by overstocking the country with sheep, followed by the rabbit invasion and later, domestic cats and foxes* (Morris, A. in “The Flora between the River Darling and Broken Hill pp.62-63 cited p.35 in Environment NSW [2002]).

As a youth Albert developed an intense interest in the flora of the far western plains and ranges of New South Wales, and by 1920 he was an active member of the Barrier Field Naturalists Club. It is evident that at this time he had also formed interests in other aspects of the arid landscapes of the west: an appreciation of their beauty and biodiversity, the detrimental impacts of pastoralism and feral animals and potential methods of land rehabilitation. The adverse urban impacts of vegetation stripping also disturbed him; he dates his interest in the establishment of a Broken Hill regeneration area from the early 1920s (Morris, A. 1938 p.46).

Albert’s knowledge of matters ecological had alerted him to the vital role of vegetation in stabilising the regional soils. His lectures and field notes of the 1920s indicate that he was aware that, given the presence of topsoil, the local flora had capacities for natural regeneration. Motivated by his conservation concerns and the Broken Hill sand-drift threat, he searched for viable ways to manage the wind erosion issue by utilising the evolved ecological functions of the local flora. As we shall see, field trials would prove to be a vital component of this search.

*Broken Hill, mining, sand and dust*

From time immemorial the Wilyakali people occupied the lands of the Broken Hill region. Pastoralists had settled these lands by c1870. The discovery of mineral wealth in 1883 led to the creation of the Broken Hill township and rapid urban development (Figure 1). In 1933 the population was 27,000 people (Commonwealth Bureau of Census and Statistics. 1938. p.320).



Figure 1. Broken Hill 1888.

(South Broken Hill Coll. Uni Melb. Archives 1974.0040.00392)

Originally the local vegetation is very likely to have been comprised of arid zone Gibber Chenopod (saltbush) Shrublands and arid zone Stony Desert Mulga (wattle) Shrublands (Keith 2004) (Figure 6). Overgrazing, rabbits and timber felling for fuel, heating and construction purposes decimated this flora.

By c1910 the local landscape consisted of large expanses of bare soil or, following rain, a sparse cover of grasses and forbs that was rapidly eaten by feral pests and stock (Figure 2). Sand dunes threatened and overwhelmed homes. Suffocating dust storms blew in from the degraded countryside to the west of Broken Hill (Figure 3).



Figure 2. Broken Hill landscape: Cable Hill 1915

(SLSA 280/1/27/108)

*At Railway Town [a suburb of Broken Hill] the force of the wind concentrates down a scoured hollow, and during a dust storm, the houses are invaded. Many homes in Wills street have been deserted and pulled down..... Two racecourses have been silted out of existence..... A seven-foot fence around the cemetery has been broken down by the [sand] accumulations.... Even middle-aged residents of the town can remember when the commons adjacent to the city were fertile and covered with tree and plant growth. Now the entire surface soil has been scooped away by the wind, leaving a bare, rubbly plain, on which a few thin cows are grazing ("Sand Drifts", Sydney Morning Herald, p.13, 22 April, 1936).*



Figure 3. Broken Hill dust storm approx. 1907

(SLSA B54756/18)

Drifting sand, dust storms and extensive erosion were not landscape features that were unique to the Broken Hill and western NSW regions. They were widespread throughout Australia, the USA and other countries that were experiencing the first and full effects of unregulated and technologically advanced land exploitation. Governments of the day were under intense pressure to combat these issues.

#### *The New South Wales Erosion Committee*

*Campaign Begins: First Shots Fired in War on Erosion. The departmental committee on erosion, which is in touch with similar bodies and bureaus in other parts of the world, is investigating all aspects of the erosion problem ("Campaign Begins", Farmer and Settler, Sydney, p.3, March 8, 1934).*

In 1934 the New South Wales state government of Bertram Stevens established the New South Wales Erosion Committee. The Committee was authorised to tour the state, take evidence on regional vegetation and soil conditions and report back to the government with recommendations to combat soil erosion.

*a. Advocacy*

On December 2<sup>nd</sup>, 1935, New South Wales Minister for Forests Roy Vincent announced that the Erosion Committee would travel to Broken Hill early in the new year to view and receive evidence concerning local erosion issues ("Erosion Danger", *Sydney Morning Herald*, p.8, 3 December, 1935). Albert Morris, Doctor Ian MacGillivray (son of Doctor Mac and also a medical practitioner) and Edmund Burnett Dow, all members of the Barrier Field Naturalists Club, were keen to meet the Committee.

The Barrier Field Naturalists Club had already raised the severity of the erosion problem in the west with the New South Wales government. The Club, with the support of the Pastoralists Association of the West Darling, had written to the New South Wales Minister for Lands in approximately October, 1935 (Barrier Field Naturalists Club. n.d.; "Soil Erosion Problem", *Barrier Miner*, p.1 December 4, 1935).

The letter expressed concern about the excessive cutting of green timber. The Club wanted dry wood to be left on the ground in order to encourage seed germination. The fencing of the public common was recommended:

*The suggestion of the club was that an area on the common say a mile wide should be fenced so that stock could not get in and that it be allowed to regenerate. Interested persons could plant saltbush and trees and native shrubs in the area.....it is the vegetation which holds the sand ("Soil Erosion Problem", *Barrier Miner*, p.1, 4 December, 1935).*

With the visit of the Erosion Committee announced, the Field Naturalists proposed to forward their letter, with its recommendations, to Minister Vincent. Secretary Albert Morris, speaking on behalf of the Field Naturalists, said that the Club would have some important suggestions to offer the Committee when it visited Broken Hill ("Soil Erosion Problem", *Barrier Miner*, p.1, 4 December, 1935).

*b. Submissions: Dow, MacGillivray and Morris*

The Erosion Committee arrived in Broken Hill on Tuesday, 21<sup>st</sup> of April, 1936, and returned to Sydney the following Tuesday. It met with representatives of Broken Hill Council, the Pastoralists Association, other commercial and community groups and individual residents of the region. Morris, MacGillivray and Dow,

representing the Barrier Field Naturalists Club, each presented the Committee with a submission. They proposed solutions to the erosion problem.

Their submissions were well reported in the local media. Edmund Dow attributed the cause of much of the regional erosion to the destruction of natural vegetation. He emphasised the detrimental siltation effect that this was having on local waterways. An extensive tree planting program was his preferred solution to the problem ("Erosion Problem West of Darling", *Barrier Miner*, p.1, 29 April, 1936).

Doctor Ian MacGillivray presented a detailed analysis of western NSW commercial stocking rates and climate statistics, demonstrating that overall natural vegetation levels had been reduced through the interaction of climate, overstocking and rabbits. Required reforms were administrative action to control stocking rates, the appointment of a forestry officer and the banning of the cutting of green timber ("District Erosion", *Barrier Miner*, p.5, 30 April, 1936).

In his submission Albert called for the fencing off of dedicated native vegetation enclosures in the paddocks of pastoral stations:

*It is suggested that each station fence a small area (preferably of several acres) to prevent access of stock, situated in a central portion of the run, where native fodder plants can grow undisturbed. This would provide a plentiful supply of seed, which would blow into surrounding areas, and would help after rain falls to cover the ground quickly. This project could be helped by seed scattering and by judicious planting at the right times, with local plants of all classes. Many of the fodder plants have seeds which are distributed by wind, such as most species of saltbush, grass etc*

*Wind swept regions, hardened into claypans, can be ploughed at right angles to the prevailing wind of the particular district. The ridges thus set up will block drift sand containing seeds, and after rain good germination results. If stock be kept off for a period, the otherwise useless area can be brought again into production ("Erosion Problem West of Darling", *Barrier Miner*, p.1, 29 April, 1936).*

Continuing with his submission, Albert referred to a 1935 field trial that he had been involved with:

*Mr Langford of K Tank [a pastoral property located 25 kilometres to the east of Broken Hill] ploughed an area of such ground in February 1935. Very little rain fell until about January 1, 1936, and none has fallen since [as at 5 April, 1936]. Quite a good growth has resulted, and is now still in a flourishing condition due to the fact that the broken soil with depressions, held the water, which previously always ran off ("Erosion Problem West of Darling", *Barrier Miner*, p.1, 29 April, 1936).*

The ploughed area was approximately 400 acres (160 hectares) and had previously been "absolutely destitute of plant life". Mr. Brougham of Yalcowinna pastoral property had conducted a similar trial ("Soil Erosion", *Sydney Morning Herald*. p.7. 24 April, 1936). Albert stressed to the Committee the important role of leaf litter and dead wood as a soil binder and enricher. Trees could be planted once smaller native plants were well established. He noted the presence of weeds and recorded in detail the botanical results of the field trial ("Erosion Problem West of Darling", *Barrier Miner*, p.1, 29 April, 1936).

Although not explicitly stated in the historical media, it is quite likely that Albert played a role in planning and supervising this field trial, with the keen co-operation of the progressive Langford. Throughout the trial Albert carefully recorded his observations and climatic, weed and botanical data and was responsible for reporting these observations and data to the Erosion Committee. The land management techniques tested are similar to those that he had been investigating for at least fifteen years: stock enclosure, seed viability and dispersal, plant succession, the impact of weeds and soil quality.

The trial would appear to have been significantly pioneering. The reporting *Sydney Morning Herald* journalist commented that it was believed to be the first of its kind in the region. The New South Wales Soil Conservation Service, not established until 1938, developed a post-Second World War interest in similar experimental concepts: assisted seed dispersal, grazing management and contour, spiral and checkerboard furrowing (Green 1989).

Albert had advanced to this level of skilled flora and soil analysis and management largely because of his innate interest in plants and particularly in the evolved flora and ecology of the local landscapes. On his botany field trips with Margaret and Field Naturalist Club colleagues he had observed at first hand the processes that were destroying these landscapes: degradation of the natural vegetation by the grazing of introduced animals.

To solve the problem Albert adopted a regeneration technique, the fencing out of non-native herbivores, that focused strongly on utilising the naturally available features of the landscape: residual plants and rootstocks, soil seedbank, litter, soil and rainfall. This technique was well developed by the early months of 1936, as demonstrated by his submission to the Erosion Committee. All that he needed now were opportunities to implement the technique, and he wasted no time in creating them.

### *3. Plantation projects: 1936-1938*

#### *Ecological restoration and amenity*

From 1936 to 1938 Albert Morris, in an honorary capacity, advised on and was closely involved with the concurrent development of four revegetation projects in Broken Hill: two tree plantation projects and two regeneration projects. A range of techniques, such as the planting of dry climate tolerant tree species and various plant regeneration strategies, were utilised. All four projects, to varying degrees, sought to achieve objectives relating to general amenity and also ecological restoration.

Amenity objectives such as beautification, recreation and sand stabilisation sought to provide practical benefits for the community and institutions of Broken Hill. *Ecological restoration* is defined as “the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed” (SER

2004). *Intention* is an important consideration when determining whether a project can be construed as ecological restoration or some other activity: was there an intent to restore some aspect of the local ecosystem, such as the flora or fauna?<sup>ii</sup>.

The two tree plantations predominantly utilised a planting technique, and amenity objectives were prioritised, with a limited ecological restoration intent also being evident. The first project, *Plantation No.1* (1936), involved the creation of a densely treed enclosure that was designed to act as a wind-break and soil stabiliser. It's highly likely that Albert intended to achieve some degree of ecosystem recovery with this project.

The second of the four projects, an additional plantation, was referred to colloquially as "one along the front and back of the cottages" adjacent to the Zinc Corporation mine, and was a more widespread tree planting project. It appears to have been conducted primarily in 1937 ("Plant Regeneration", p.14, *Barrier Miner*, 11 December 1937). Referred to here as *Plantation No.2*, it was designed to improve resident amenity by the selective planting of appropriate trees in the mine lease and urban areas of Broken Hill. It possibly had a limited ecological restoration intent.

These two plantation projects are outlined in this section. The third and fourth Broken Hill projects prominently displayed a distinct intention to pursue ecological restoration outcomes by the use of an appropriate technique. These two projects are outlined in *Section 4: Regeneration projects: 1936-39*.

[The following account of the development of the four Broken Hill plantation and regeneration projects is quite detailed. To assist the reader the account is augmented by the attached Appendix A (Chronology) and Appendix B (Schematic Map)]

#### *Plantation No.1: May-September 1936*

On May 25, 1936, A.J. (Jim) Keast, the newly appointed Zinc Corporation Mine Manager, announced plans for the construction of a new mine and office complex on the south-west perimeter of Broken Hill, not far from Wentworth Road on the city outskirts. Demolition of the old mine buildings had already commenced ("Big Building Plan", *Barrier Miner*, p.3, 25 May, 1936). The Zinc Corporation was one of the three large mining companies that operated in Broken Hill. Their new mine complex, a major and expensive development, was to be sited on a bare, wind-swept piece of ground. Sand-drifts were a concern.

To deal with the sand the Corporation had decided to construct an enclosed, irrigated tree plantation, and this intention had been announced on the previous Monday, May 18<sup>th</sup>. It was hoped that the plantation would shelter the new mining complex from the prevailing westerly winds and the accompanying sand ("Sand Drift To Be Stopped", *Barrier Miner*, p.1, 18 May, 1936).

Work on a galvanised iron and chicken wire stock and rabbit-proof fence for the plantation had already

commenced. A saltbush hedge, intended to act as a sand stabiliser, would be planted. The trees to be used would be similar to those planted in the landscaped grounds of the Broken Hill Hospital ("Sand Drift To Be Stopped", *Barrier Miner*, p.1, 18 May, 1936). This main plantation was termed *Plantation No.1*.

To facilitate the mine and plantation construction process the efficient Keast had bought the local and disused Tarrawingee Railway and its rails. Work on ripping them up was to commence on Tuesday, May 26th ("Tarrawingee Railway", *Barrier Miner*, p.3, 25 May, 1936). The rails also proved to be useful during the construction of the initial regeneration reserves, and may be seen today, still solidly fencing those reserves (Figure 5).

Creating a tree plantation in arid Broken Hill and using saltbush as a sand stabiliser were activities that Albert Morris had some expertise with. In fact, he was well informed about the proposed Zinc Corporation plantation: on May 9<sup>th</sup> he had met with Keast and Maurice Mawby, a mining company metallurgist and also a member of the Barrier Field Naturalists Club. They knew of Albert's expertise. The latter advised that a plantation was feasible and agreed to help with the project. He also explained that in a protected enclosure, native vegetation would re-establish itself ("Plant Regeneration", *Barrier Miner*, p.14, 11 December, 1937; Morris, A. 1938 pp.43-44).

Throughout the winter of 1936 work on Plantation No. 1 and the new mine complex continued. The respective sites were virtually adjacent, with the plantation of approximately 22 acres located just to the south of the building site. A nursery was established. A tank placed on a high rise would provide water for irrigation, via gravitational feed (Morris, A. 1938 p.45). The fence around the plantation was galvanised iron on three sides with a rabbit-proof mesh fence on the mine complex side ("Plant Regeneration", *Barrier Miner*, p.14, 11 December, 1937)<sup>iii</sup>.

Today Plantation No. 1 is known as *Zinc Lakes* or *Twin Lakes Park*, named after the lakes that were created out of a section of the plantation in 1945, with some loss of trees ("Beautification at Zinc" *Barrier Miner*, p.3, 31 October, 1945). The *Albert Morris Memorial Gates* now grace the entrance to the park, on Wentworth Road.

#### *Plantation No. 1 development and Plantation No. 2: October '36-1937*

Planting in Plantation No. 1 was scheduled for spring, 1936. The seeds of trees and shrubs were collected for propagation in the nursery. A total of 1600 local provenance young River Red Gum (*Eucalyptus rostrata*; syn. *E. camaludensis*) were transplanted into tin containers and raised in the nursery (Morris, A. 1938 p.45).

One thousand Old Man Saltbush were planted in October, 1936. Holes for approximately 3000 trees were prepared and irrigation drains were ploughed by a camel team. On approximately January 12, 1937, planting of the transplanted and nursery raised River Red Gum commenced. Ongoing planting

then continued for quite a few months (Morris, A. 1938 pp.45-47). The provenance of the seeds of the other local trees and shrubs was not specified, but it is highly likely that at least some would have been local stock.

A second planting program, in addition to Plantation No.1, was also undertaken. This work, Plantation No.2, was focused on the cottages on the Railway Town and South Broken Hill sides of the Zinc mine lease ("Plant Regeneration", *Barrier Miner*, p.14, 11 December, 1937). It also extended over the Zinc Corporation lease. Fencing was erected in these urban areas and general beautification planting of the Zinc Corporation lease commenced around February, 1937. A wind-break was created. Mine cottages, the manager's residence and roadways were landscaped with a wide range of plants (Morris, A. 1938 p.47). Much of this work can still be seen.

*There are 18 different varieties of gum trees and 13 of wattles, as well as many other kinds of trees and shrubs, such as black oak, myoporum, quandong, pittosporum, bullock bush, beefwood, tea trees, etc., in use in the plantations, as the different soils are best suited to different kinds. All the plants used in this work are grown from dry country forms suited to the natural rainfall and from seeds gathered from plants grown under local conditions, by which means the highest resistance to our peculiar conditions is obtained" ("Plant Regeneration", *Barrier Miner*, p.14, 11 December, 1937).*

Plantation No.1 does exhibit a degree of intention to employ ecological restoration techniques. As we have seen, Albert anticipated that local flora would regenerate inside the stock and rabbit proof enclosure and this occurrence was planned for (Morris, A. 1938 p.44). Old Man Saltbush and River Red Gum, both local species, were extensively planted. It is highly likely that other local shrubs and trees were among the "fifteen different kinds" documented to have been planted here (Morris, A. 1938 p.47). It is quite possible that Albert exercised an intention to provide habitat for local bird species. In the context of the highly degraded local ecosystem, this project does represent a first step towards restoration of former ecological structure and function.

Plantation No.2 possibly had a limited intention to employ ecological restoration techniques. It is highly likely that some local tree and shrub species were used ("Plant Regeneration", *Barrier Miner*, p.14, 11 December, 1937). It may have been intended that local fauna, especially birds, would benefit.

Albert's nursery management methods are worth noting. They were standardised, documented and skilled. He had developed techniques for the collection of seed and the propagation and transplantation of native plants using a specialist on-site plant nursery (Morris, A. n.d. 1). These techniques closely parallel contemporary bush regeneration plant stock management technology.

The Zinc Corporation also sponsored a general beautification scheme at Broken Hill Cemetery in 1938. New gates were erected (extant) and saltbush was planted to control the extensive sand-drift that was occurring there. This work complemented previous efforts by Albert and members of the Barrier Field Naturalists Club to establish the Doctor William MacGillivray Memorial Drive (extant).

#### 4. Regeneration projects: 1936-1939

At the same time that Albert was engaged by the Zinc Corporation as an adviser to their two plantation projects he was also involved in the development of two regeneration projects. Planning for the first of these, the *reservoirs regeneration project*, commenced in May, 1936. New South Wales state government approval for the project was granted in September, 1937 and the on-site work was done in April, 1939. The aim was to nurture the regrowth of the natural vegetation on the site and to restore a considerable degree of ecological function to two reservoir reserves in Broken Hill. There may have been an amenity component.

The second and most significant of the projects to be outlined in this section, the construction of the regeneration reserves of the pre-Second World War *Broken Hill regeneration area*, was initiated by Albert Morris and received extensive administrative and financial support from the Broken Hill mining industry. It was planned, approved and commenced in the spring of 1936. The project involved the construction of a set of fenced regeneration reserves in the public common in 1936-37 with additional reserves being added between then and 1939. As we have seen, the concept had already been proposed to the New South Wales state government in 1935. Albert's intention was to employ a technique that would restore a considerable degree of the local ecosystem's floristics and functionality and provide sand control amenity for the residents of Broken Hill.

##### *The reservoirs regeneration project: May 1936-1939*

From c1920 Albert had researched and experimented with regeneration methodologies. By the commencement of 1936 he had firmly settled on a preferred technique, as demonstrated by the 1935 K Tank Station field trials, the Barrier Field Naturalists' 1935 letter to the New South Wales government requesting the fencing of the common and his submission to the April, 1936 hearings of the NSW Erosion Committee.

Keen to demonstrate the potential of his technique, Albert, with the support of the Barrier Field Naturalists Club, initiated a regeneration project. The project priority was to restore the native vegetation of the site. An intention to restore ecological function by facilitating the regrowth of the natural vegetation is evident.

A committee meeting of the Barrier Field Naturalists Club, held on May 27, 1936, acting on a suggestion from Albert Morris, passed a motion to write to the New South Wales government and request the fencing of the two water reservoir reserves located within the urban area of Broken Hill, namely

Waterworks Hill and Block 10 Hill. The objective of the motion, moved by Mr. Faehrmann, was "...to keep off stock to enable natural regeneration of plant life..." (Barrier Field Naturalists Club. 1936). After months of deliberation New South Wales Minister for Works and Local Government Spooner refused the request in November, 1936 (Spooner 1936).

Club Secretary Morris raised the reservoirs regeneration project with the Minister again in April, 1937. A list of the native plant species identified on the Block 10 Hill site, indicative of the natural regrowth potential on the Hill, was supplied to the Minister. Some tree planting was suggested, maybe because 1937 was a designated *Tree Year* (Morris, A. 1937a). Spooner was not convinced and again refused the request (Spooner, 1937a).

Albert and the Barrier Field Naturalists persevered. He wrote to the Minister for a third time on the 15<sup>th</sup> of July, 1937, repeating the request: "to enable natural regeneration of the flora thus providing some natural bushland in the heart of the city" (Morris, A. 1937b, p.1). Perhaps slightly worn down, Minister Spooner finally consented to the fencing proposal in the following September (Spooner 1937b).

Just to be sure that the Minister had fully understood the intricacies of the project, Albert promptly wrote again to confirm that the fence would consist of rabbit-proof one and a half-inch wire netting. Spooner replied that he would be pleased to check on this detail (Spooner 1937c).

The fencing work was carried out in approximately April, 1939 (Brooks 1939; Committee, Barrier Field Naturalists Club 1970. April 26, 1939). Remnants, with the requisite one and a half-inch rabbit proof wire netting, may still be seen on Block 10 Hill, near A.J. Keast Park (Figure 4).

This project represents one of the first known and documented attempts in Australia to intentionally institute the regeneration of the native vegetation of specified sites primarily using naturally occurring resources. The stated intention was to fence, exclude rabbits and stock and allow the protected vegetation to recover. It was an actual management project and not an experiment.

Albert's repeated efforts to establish these reserves illustrates his and the Field Naturalists Club's commitment to establishing a practical regeneration project, to promote a range of civic and environmental benefits. It may well have been Albert's intention to establish this regeneration project as a form of demonstration model that displayed the efficacy of his regeneration technique. His determination and attention to detail are noteworthy.



Figure 4. Block 10 Hill

( Photo: 2017 P Ardill)

#### *The pre-Second World War Broken Hill regeneration area: September 1936-1939*

Albert also became involved in a second major regeneration project in 1936. It involved the creation of the regeneration reserves of the pre-Second World War *Broken Hill regeneration area*. Further reserves were added to this area after the War, and collectively all of the reserves became known as the *Broken Hill regeneration area*. The remainder of this article focuses on the creation of each of these sets of reserves.

On Monday September 7<sup>th</sup> of 1936, Mr. Fairweather of the Broken Hill Mine Managers Association, representing the three major mining entities in the city, made a surprise announcement. The Association was funding an “experiment” that would involve the fencing of a strip of land with a rabbit-proof fence, half a mile wide, beyond the Zinc Corporation’s new plantation and mine (“Sand Drift Problem”, *Barrier Miner*, p.1, 7 September, 1936).

The objective of the experiment was to encourage the growth of the local flora and so stabilise the drifting sand of the area. Work would commence shortly. The fencing would stretch from the old South

racecourse to the Silverton Tramway line. The article made no mention of the fact that as a result of the fencing, a large portion of the public common would no longer be accessible to the residents of the city.

The Zinc Corporation's Plantation No.1 project had, in the space of approximately 15 weeks, given rise to the creation of an extensive regeneration area project. The specific regeneration technique to be employed was beautifully simple: fence, protect and allow the natural vegetation to re-establish itself. It was an innovative plan requiring prior knowledge of the flora and ecology of the Broken Hill region and some experience with regeneration techniques: who devised it?

#### *The origin of the 1936 regeneration reserves announcement*

As described above, with Plantation No. 1 fenced but still in an unplanted condition throughout the winter of 1936, native grasses germinated and covered the previously bare soil. Albert Morris, anticipating this event, was alert to the possibilities that it created.

Albert had always maintained that with protection from grazing "the country would 'come back'" (Morris, M. 1939c. p.46). In her Adelaide *Chronicle* series of articles, Margaret allots credit for the regeneration area project to Albert, Keast and Mawby, but notes that "years ago" Albert had conceived the idea of a fenced, natural regeneration area around the city (Morris, M. 1939a). Albert himself referred to this vision of a regeneration area as the "dream of my life" (Morris, A. 1938 pp.46). At a meeting with W.S. Robinson, a senior Zinc Corporation executive, at an unspecified time between 1935 and mid-1936, Albert had expressed an interest in establishing "revegetation belts" around the city (Jones 2016 p. 46; Richardson 1988). Prior to the fencing of Plantation No.1, Albert had told Maurice Mawby that "the grasses and sub-shrubby plants will come back after the first rain..." (Morris, A. 1938a p.44).

Albert Morris had a demonstrated track record of involvement with enclosed regeneration areas. From 1935 he had been involved with a field trial at K-Tank Station that restored a fenced and ploughed scald (a severely eroded area of soil) of 400 acres. In 1935 he and the Barrier Field Naturalists Club had requested the state government to fence a section of the Common. Albert and the Club had initiated their reservoir regeneration project in May, 1936.

Experientially, Albert was equipped to recognise indicators of potential for site regeneration by germination and regrowth of the local flora. His lectures and notes, which included references to regeneration from rootstocks and from seed stored in the topsoil, suggest that he also had a working understanding of how to facilitate and maintain this regrowth.

Conceptually, the leap from tree plantations to naturally resourced regeneration reserves is a big one. To understand that nine types of sprouting grasses were a sign that a viable regeneration area could be created required detailed knowledge of many aspects of the ecology of the proposed site. It is clear in hindsight that Albert possessed this prerequisite knowledge and that he was well aware of the

ecological implications of spontaneous vegetation regrowth for the establishment of a successful regeneration area.

The enterprising Albert approached Keast. With Plantation No. 1 fenced, by *Early in October... the paddock* [No.1 Plantation] *was showing the effect of keeping stock off, and grasses were showing in all directions. Nine kinds were observed during the first few months...and other native plants were plentiful.* Armed with this strong evidence of the natural regeneration capabilities of the site and aware of the implications, Albert spoke to the mine manager: “Mr Keast listened to the dream of my life” (Morris, A. 1938 pp.46)

The reference to “October” confuses the chronology, but Albert says that the grasses were observed during “the first few months”. The fencing of Plantation No. 1, around 22 acres in size and requiring approximately 1.5 km of fencing, had been commenced by mid-May, and is likely to have been completed in a few weeks. The formal announcement of the larger regeneration “experiment”, which was in fact the start of the construction of what we now know as the Broken Hill regeneration area, was made in early September. The grasses and native plants must have been observed from June to August, “the first few months”.

“The Greening of the Hill”, by Horace Webber, contains a transcript of a conversation in which Albert proposes the regeneration area project to a nonplussed Keast. Keast’s memoir, “Straws in the Wind”, is cited as the main reference for this particular chapter of the book. The provenance of the actual transcript is not specified (Webber 1992 pp. 74-75).

Keast himself, two and a half years after the event, in a public and printed tribute, unequivocally gave Albert Morris the credit for the creation of the regeneration reserves (Keast 1939 p.3). All of the documented evidence indicates that Albert wanted to establish a regeneration area around Broken Hill and that he initiated the negotiations for the development of this plan. But he had to do more than just show Keast some grasses.

It is one thing to recognise the signs of potential capacity for regeneration in a fenced paddock and explain the relevant science to a mining company manager. Albert also had to motivate Keast to support the proposed regeneration project and obtain the requisite senior executive approval.

Until the September 7<sup>th</sup> announcement, the demonstrated interest of senior Zinc Corporation executive Robinson in erosion control was to protect the Zinc Corporation mine and improve the working conditions above it (Webber 1992 p.55-56). Robinson wanted sand control projects in place where the lead, silver and zinc lodes were located (Mawby 1975). Albert himself makes it abundantly clear that the Zinc Corporation’s interest in controlling sand-drift was related to their mining ventures: “How can the new works be protected?” (Morris, A. 1938 p.43).

The Zinc Corporation sought Albert’s assistance with a tree plantation project that was obviously designed and located to protect their mining interests. Nevertheless, and displaying civic merit, the three city mining companies agreed to combine and create a series of regeneration reserves as a “social service” (Morris, M. 1939c pp.46-47). Why?

Albert and Margaret and their neighbours in Cornish Street, Broken Hill, had first-hand experience of the realities of drifting sand and dust. Fences, gardens, and gates were buried (Morris, M. 1975 p.2). Albert's dream had always been to have a city-wide regeneration area, so that the benefits could be enjoyed by all. He was concerned for the individuals who had to abandon their homes to sand (Morris, A. 1938 p.46-47).

Albert would have been well prepared when he explained to Keast the significance of the natural regrowth in the fenced plantation. The combined benefits that would come to the city and the mining companies if an extensive regeneration project was implemented must have been discussed in depth. To Keast's credit, he listened and saw the merits of Albert's position. "After further talks, the manager was convinced of the effect of fencing and what could be expected in years to come" (Morris, A. 1938 p.47).

The documented chronology suggests that the two men must have discussed the matter in mid-August or thereabouts. Keast was successful in obtaining approval for the plan from senior Zinc Corporation executives and Margaret Morris acknowledged the "interest and very generous support" that Keast and Robinson extended to the project (Morris, M. 1939c p.47). The support of the other two Broken Hill mining companies was also enlisted (Morris, A. 1938 p.47). The consent of Broken Hill Council to fence the public common was obtained on August 27 (Broken Hill City Council, 1936). The historic September 7<sup>th</sup> announcement followed.

Only a person who had supreme confidence in his own knowledge and practical experience of rehabilitation and land regeneration could have displayed the enterprise to propose, on the evidence of three months of plant growth, such an ambitious, expensive and innovative project. Albert knew that success was highly probable. He launched the construction of the initial Broken Hill regeneration area in August, 1936.

The resulting regeneration reserves were in fact not an exercise in restoration *experimentation*. The intention was to regenerate a severely degraded site using a technique grounded on the principle of prioritising the use of naturally occurring resources. The technique was tested and an intention to effect ecological restoration and provide sand control amenity is evident.

#### *The construction of the initial set of regeneration reserves: Spring '36 – Summer 1937*

The first set of regeneration reserves of the pre-War Broken Hill regeneration area was created between the old South racecourse (corner of Queen and Jamieson Streets, South Broken Hill) and Silverton Tramway line (non-extant), near the Cemetery (Barrier Highway). The surveying of the site was completed by the end of October, 1936 ("More Trees", *Barrier Miner*, p.1, 10 November, 1936).

By early November the fencing between the racecourse and the town abattoir, about mid-way to the

Cemetery, had been completed. At this stage of their development, the regeneration reserves were being described as a mixture of “tree planting campaigns and the encouragement of the growth of natural flora” (“More Trees”, *Barrier Miner*, p.1, 10 November, 1936). The fencing work had commenced at the old racecourse and so the first regeneration reserve to be fenced was located adjacent to and south-east of Wentworth Road, extending to the old South racecourse (non-extant) (Figure 5).



Figure 5. Reserve No. 1

(Photo: 2017 P Ardill)

Plantation No.1 and the regeneration reserves are clearly referred to as distinct entities in a 1936 article in the *Barrier Miner*. The Zinc Corporation has constructed an

*experimental sand-drift plantation.....The North, South and Zinc Corporation mines have also combined efforts in erecting a vermin-proof fence from the old South racecourse to the rear of the Cemetery.....in which will be grown native flora* (“Splendid Outlook”, *Barrier Miner*, p.9, 12 December, 1936).

The experimental nature of the latter project was again alluded to: the reserves will only be extended if successful. Understandably, the Mine Managers Association regarded the fencing project as experimental. To the uninitiated the whole concept was pioneering and radical.

Albert, Margaret and their colleagues, given their acquired knowledge and experience, must have been

feeling quietly confident of success. For them, the unknown quantities of the project would have related to community reactions to the fencing of the public common and the possibility that below average rainfall or actual drought could delay plant regrowth and impede progress towards effective sand control, raising doubts about the project's efficacy.

The fencing of this first set of regeneration reserves, between the old South racecourse and the Cemetery, was completed in February, 1937:

*The fencing of these paddocks was only finished last February but they are already proving their worth, as the grass is waving about two feet high over a large area, especially in the paddock behind the Cemetery.....* ("Plant Regeneration", *Barrier Miner*, p.14, 11 December, 1937).

The rains had been kind: virtually half a year's average rainfall had fallen in the summer of 1936-37 (Bureau of Meteorology).

There must have been some celebrations in Cornish Street when the last section of fencing was done near the Cemetery in February, 1937. And perhaps a little apprehension too; how would the fencing of the once public common be received?

*The first set of regeneration reserves: 1936 or 1937?*

Margaret Morris maintains that after seeing how well Plantation No.1 was doing, Albert spoke to Keast in 1937 about establishing a "fenced area", or the regeneration area reserves (Morris, M. 1939d). The regeneration reserves were "done in the spring and summer of 1937 and early in 1938" ("Regeneration Areas", *Barrier Miner*, p.7, 30 September, 1939; Morris, M., 1939c, p.47). "These first areas were fenced just two years ago" i.e. late 1937 (Morris, M. 1939d).

On any reading Margaret's statements are unambiguous, but she was mistaken. Albert must have spoken to Keast about the matter in early to mid-August, 1936. Broken Hill Council's approval of the regeneration project on August 27th, 1936 and the formal announcement of its commencement on September 7th, 1936 are clearly documented. Consistent documentation also demonstrates that work commenced in the spring of 1936 and that the first set of reserves was completed in February, 1937. In a 1938 article Albert recorded that work on the site commenced "almost immediately" after he convinced manager Keast of the merits of the fencing project (Morris, A. 1938 p.47).

There may be any number of reasons as to why Margaret made the mistake with the dates. Speculation of this sort should not overshadow her significant contributions and commitment to the regeneration project.

*Restoration technique in the first set of regeneration reserves*

Initially, vegetation establishment in the first set of regeneration reserves, between old South racecourse and the cemetery, was left to natural processes (Morris, A. 1938 p.48). The reserve adjacent to Plantation No.1 was the exception to this rule. It was located immediately west of Wentworth Road and received a more intensive treatment than the other reserves.

On January 9<sup>th</sup> 500 saltbushes were planted there (Morris, A. 1938 p.47). It was ploughed in 50 yards squares to break up scalds and to allow seed to collect and germinate. Over 1000 saltbushes and 750 trees were planted, probably throughout 1937. Seed was also scattered at some time in 1937 ("Plant Regeneration", *Barrier Miner*, p.14, 11 December, 1937). Margaret Morris comments that this regeneration reserve was irrigated and planted in much the same way as Plantation No.1 (Morris, M. 1939c, p. 47). All of this work would have commenced after the reserve was fenced in approximately December, 1936.

In 1947 New Broken Hill Consolidated constructed a new mine complex, oval and landscaped areas over a large part of this reserve, destroying much of the planting and natural vegetation regrowth ("N.B.H. Consolidated", *Barrier Miner*, p.4, 30 September, 1947). Very little of the original reserve can now be seen.

*Administration of the regeneration reserves*

On October 7, 1936, the Barrier Field Naturalists Club resolved to request the relevant authorities to have the fenced areas on the common declared a sanctuary for flora and fauna (Committee, Barrier Field Naturalists Club 1970. October 7, 1936). The regeneration reserves located on Crown Land were notified as being set aside "For Preservation of Native Flora" on the 18<sup>th</sup> of June, 1937 (*Government Gazette NSW*, 18<sup>th</sup> June 1937, Issue No.84, p.2354).

The Western Lands Commissioner met with representatives of Broken Hill Council and the Mine Managers Association on May 28<sup>th</sup> 1937, to "discuss provisions to give effective supervision to the companies' regeneration scheme". The parties agreed that the Council should be appointed trustee ("Common Area Regeneration", *Barrier Miner*, p.6, 29 May, 1937). This agreement was given effect to on August 12, 1937 (*Government Gazette NSW*, 12<sup>th</sup> August 1937, Issue No. 118, p.3313).

The rigorous by-laws governing the management of the reserves were published on March 25<sup>th</sup>, 1938. Public access was forbidden and rangers were to be appointed to enforce the by-laws (*Government Gazette NSW*, 25<sup>th</sup> March 1938, Issue No. 46, p.1279).

Vandalism was already occurring. Albert Morris, Jack Scougall and Maurice Mawby were immediately appointed rangers, with three others ("Rangers Appointed", *Barrier Miner*, p.3, 25 March, 1938).

Scougall had been involved with Albert and the plantation scheme since its inception, and by 1942 he was plantation foreman ("Amazing Productivity", *Barrier Miner*, p.5, 25 July 1942). After c1940 he also managed the Zinc Corporation nursery for an extended period of time.

*Further regeneration reserves: 1937-1938*

The South Australian Soil Erosion Committee, chaired by Mr. W. J. Spafford, visited Broken Hill in June, 1937. Albert Morris hosted the Committee at his home garden and conducted them on a tour of the plantations, nursery and reserves. Spafford and the Committee were highly impressed by the regeneration area project, and suggested that the reserves be extended from the old South racecourse to Bonanza Street (airport road). Keast, MacGillivray and Dow also met the visiting committee ("Checking Drift", *Barrier Miner*, p.3, 18 June, 1937).

Indeed, during August and September, 1937, the section between the old South racecourse and Bonanza Street was fenced, and at this time plans were also being made for the extension of the regeneration area from the Cemetery to the western side of Schlapp Street, to the north-west of the city. Keast is reported to have been very pleased with the vegetation results achieved so far and was expecting a big improvement in the sand-drift problem ("Sand Drift Problem Being Tackled", *Barrier Miner*, p.1, 20 August, 1937).

The north-western Silvertown Road and Schlapp Street extension commenced in December, 1937, and was completed by March, 1938. However, The Mine Managers Association had no plans to further extend the fenced area: the present reserves had to be proven "beyond doubt" to be a success ("Plant Regeneration", *Barrier Miner*, p.14 11 December, 1937; "Stemming Tide of Drift Sand", *Barrier Miner*, p.1, 15 February, 1938).

In approximately August 1938, Albert summarised the management principles applied to the reserves constructed by this time:

*With the exception of the section behind the Albert Morris Park.....the regeneration paddocks have been left to nature, no planting having been done. They showed good growth of spear grass.....There are now eight of these paddocks, and several of them are still waiting for a rain to enable vegetation to grow...Native seed will be freely scattered in some paddocks, while others will be left to nature...*

He commented that bare patches of ground would be better if ploughed to hold drift-sand and seeds, and a little had been done successfully.

*It has been proved in many places. The furrows also hold the water and prevent run-off... Mulgas and Cassias over a foot high and a few "Dead Finish" (Acacia tetragonophylla) have come back between rock cracks apparently from near dead stumps that have had no chances to grow for over forty years (Morris, A. 1938 p.48)*

*The final pre-War regeneration reserve: Dec'38- March 1939*

The final reserve of the pre-Second World War series of regeneration reserves was fenced between December, 1938 and March, 1939. Land between Bonanza Street (the airport road) and South rifle range, along the south-east perimeter of the city, was enclosed. This work was financed by the New South Wales state government of Premier Bertram Stevens, with Minister for Local Government Spooner providing a grant of two thousand pounds. The South Progress Association successfully lobbied for the creation of this reserve ("Regeneration Area Work", *Barrier Miner*, p.3. 12 December, 1938; "Excellent Progress", p.1, *Barrier Miner*, 24 February, 1939). The Mine Managers Association had financed the construction of the previously fenced reserves.

The involvement of the community group is indicative of the growing awareness in the city of the benefits of the reserves. Albert may have offered them a little advice on how to negotiate with Minister Spooner.

Writing in September, 1939, Margaret Morris summarised the regeneration techniques applied to the now completed reserves of the pre-War regeneration area:

*the reserve...behind Albert Morris Memorial Park [Plantation No.1] has been extensively planted and is irrigated in the same way as the park. Several others have had a little planting done in them by various progress associations...seeds have also been scattered in places, but some enclosures have been left to nature...." (Morris, M., 1939c, p.47).*

As foreshadowed by Albert in 1938, seed had been scattered in some of the reserves. Maybe Margaret Morris arranged for this to be done in 1939, following the good rains of February, March and April of that year. Planting had also now been done in some more of the reserves. Community groups conducted planting sessions, sometimes using non-local species such as the imported Athol pine (*Tamarix aphylla*), now an inland weed pest.

Broken Hill was now half-encircled by the regeneration reserves of the pre-War regeneration area. They stretched from the north-west of the city, around the western perimeter and then past the airport to the south-east sector.

*Challenges and tragedy*

The claimed benefits of the regeneration area, namely control of dust and sand, did not appear overnight. It was not until mid-1938 that they became obvious (Morris, A. 1938 p.48).

The drawbacks to the project were immediately noticeable. Citizens who had previously accessed this large section of public common for firewood, food resources such as mushrooms and rabbits and stock

grazing were now prevented from entering it. Infringements of the regulations incurred fines. This created some tensions.

In April of 1937 extensive vandalism (or theft) in a reserve was recorded. A strip of wire netting 20 yards long was removed from the section near the Cemetery ("Vandals Responsible", *Barrier Miner*, p.2, 16 April, 1937). This was a major concern as it would allow in stock and rabbits.

Over the years there were many reported incidents of theft of fencing and firewood. Cutting of fences occurred. Flowers and the plants themselves were often collected. Unauthorised intrusions with motor vehicles and animals were recorded. Rubbish was dumped.

Some of the vandalism may have resulted from social tensions in the city. The Mine Managers Association was a supporter and financier of the regeneration area project, along with the conservative New South Wales state government of Bertram Stevens.

Broken Hill had a strong trade union tradition, with a history of bitter disputes between the unions and mining companies. There was a major mine strike there in October, 1936, involving approximately 3400 workers, so the regeneration project was initiated during a turbulent period ("*Barrier Strike*", *Newcastle Morning Herald and Miners' Advocate*, p.13, 2 October, 1936). The reserves were an easy target for any disaffected citizens.

There were environmental challenges. For Albert and his colleagues the Broken Hill project was a first step towards the restoration of the degraded arid landscapes of western New South Wales. However, the reality was that it was being financed with a view to suppressing dust and sand-drift around the city and the mine works. To be considered a practical success the reserves had to rapidly achieve this specific objective. Effective flora regrowth was required.

Extended periods of dryness and drought could set back seed germination, plant succession and comprehensive site regeneration. In the short-term this could impede the sand stabilisation effectiveness of the project and create managerial and community doubt about its viability.

Compounding this issue was the unknown extent to which seed of local flora species was naturally distributed within the reserves. Lack of seed of crucial species or uneven seed distribution could further impede plant succession and the dust control capabilities of the project.

Finally, there were scalds in the reserves. These areas of baked clay carried virtually no seed and rainfall failed to penetrate their solid crust.

Utilising his previous experience, Albert planned to manage the seed distribution issue by arranging for the scattering of seed in some of the reserves, and ploughing would alleviate the scald problem (Morris, A. 1938 p.48). The weather was beyond his control.

Rainfall in 1936 was below average, but the summer of 1936-1937 was fortuitously wet. The final total for 1937 was only slightly short of the annual average. 1938 proved to be a dry year, with only 60% of the average eventuating. The first six months of 1938 were exceptionally dry, yielding less than 30mm in

total (Bureau of Meteorology). The new Silverton Road precinct reserves were still showing no signs of flora regrowth later that year (Morris, A. 1938 p.48). Crucially, the rains of 1939 were heavy, particularly in the first six months of the year, and the flora responded accordingly. Sadly, Albert did not live to see this happy development.

All projects are subject to setbacks, disruptions and even tragedies, and the tragedy of this project was the premature death of Albert, aged 52. He was taken seriously ill in September, 1938. Diagnosed with a brain tumor condition, he received specialist treatment in Adelaide, returned to Broken Hill in early November, 1938 and was hospitalised. He died on January 9, 1939.

In a generous tribute published that day, A.J. Keast unequivocally accorded Albert full credit for the establishment of the plantations and reserves (Keast 1939 p.3). Margaret described him as “one who always worked for the good of all” (Morris, M. 1939b). He did live to see the regeneration area project progress to cover the complete west and southerly aspects of the city, and this must have been enormously satisfying for him.

Albert was a dedicated ecological regenerator and conservationist. Given his determination, enthusiasm and energy, it is not idle speculation to believe that in the absence of the Zinc Corporation plantation project, he would have proceeded, by some other enterprising means, to realise his dream of a Broken Hill regeneration area. It is a surety that he would have.

## *5. War, consolidation, evaluation: 1939-1945*

### *War*

The exposed westerly and southerly sectors of Broken Hill were now protected. There was a hiatus of eleven years before work started on completing the encirclement of the city with further regeneration reserves. In 1939 there was no certainty about this work being done.

The Mine Managers Association and the authorities were probably still cautious: were the regeneration reserves a success beyond doubt? The man who might persuade them of this was dead. The September, 1939 outbreak of the Second World War and its insatiable demand for human and material resources finalised the matter; winning the War overrode all other priorities. In Broken Hill the regeneration project's supporters, with Margaret Morris playing a leading role, consolidated, evaluated and looked to the future.

*Margaret Morris, evaluation, publicity*

“We at the Zinc Corporation, offer our sincere sympathy to Mrs Morris, who, I am assured, will carry on the good work of her late husband” (Keast 1939 p 3). Margaret planned to maintain her involvement with the regeneration project and Keast was reassured by this. Such mutual confidence was obviously a reflection on her prior contributions to the project.

E.B. Dow retired and moved from Broken Hill in April, 1940 and Dr. Ian MacGillivray was practising medicine in Murwillumbah, NSW, by 1940. Following on Albert’s death, these further losses of expertise and support were additional setbacks. Under challenging circumstances Margaret carried on with the work during the period 1939-44.

Throughout the war years the administrative and financial management of the regeneration reserves was primarily overseen by Keast, Mawby, the Mine Managers Association and Broken Hill Council. In particular, the Mine Managers Association contributed strongly to the ongoing maintenance costs during this time.

With the funding worry removed, Margaret was free to concentrate on applying her skills in the fields of botany, seed collection, plant propagation and nursery management. As we shall see, she was highly aware of the favourable aesthetic and social impacts of the regeneration area. (She undoubtedly urged Albert to elaborate on these impacts when he prepared for his chat with Keast in August, 1936). She was a competent writer and publicising the features and benefits of the reserves became her strong suit.

Margaret worked daily on nursery and botanical tasks. She propagated plants at her home, managed the Zinc Corporation nursery and with the advantage of years of study with Albert, gave specialist advice on botanical matters (“Twenty Years”, *Barrier Miner*, p.1, 13 April, 1939). Her opinions on the regeneration aspects of the management of the reserves would have been influential.

In 1939 Margaret participated in an extensive botanical evaluation of the reserves and published the results in the *Australian Journal of Science* (Morris, M. 1939c). The University of Sydney botanists who conducted a comparative study of the fenced and unfenced flora in August, 1939, acknowledged her assistance in their published paper (Pidgeon & Ashby 1940).

In a report to Broken Hill Council in September, 1939, Margaret described the vegetative development of the reserves and recommended that flora surveys be done on a regular basis (“Regeneration Areas Show Big Improvement”, *Barrier Miner*, p.7, 30 September, 1939). In 1942 she assisted with a flora survey conducted by Clarence Chadwick and a group of botany students (“Plant Study in Regeneration Area”, *Barrier Miner*, p.4, 18 August, 1942).

Given her interest in flora and botany, the rainfall of 1939 must have pleased Margaret. The first six months yielded nearly a complete year’s average rainfall and overall the year was well above average (Bureau of Meteorology). By spring all of the reserves were doing well. The perennial grasses were

thriving and the growth of trees and shrubs was “little short of marvellous” (Morris, M. 1939c, pp. 47). The good rain would have assisted new growth to set deep roots and survive the drought of 1940.

Margaret regularly had published newspaper articles describing the benefits that the regeneration area brought to Broken Hill and the populace. In a series of articles in the Adelaide newspaper *The Chronicle*, she pointed out how the reserves had transformed Broken Hill: “The fact that a big company is spending so much on their property gives the town a feeling of permanency that has always been lacking” (Morris, M. 1939b, p 12).

Margaret promoted the tourism benefits. Visitors were attracted to the city by the now flourishing wildflowers (“Regeneration Areas Show Big Improvement”, *Barrier Miner*, p.7, 30 September, 1939). She wrote about the history of the project and elaborated on the principles of natural regeneration. The importance of using *native* trees and shrubs was constantly emphasised (Morris, M. 1939d).

In a highly relevant and perceptive article, Margaret commented on the severe drought of 1940. Mulga and other acacias, the cassias (*Senna* spp.) and other trees and shrubs were doing well in the reserves despite the extreme conditions. The grasses were dried out but not dead, and the roots would continue to hold the sand as long as stock was kept away. The grass seed was well preserved and would germinate when the rains returned (Morris, M. 1940). She constantly reminded the Broken Hill community of the beautification aspects of the regeneration project (Morris, M. 1941).

Margaret’s carefully chosen words reassured the residents, the Mine Managers Association and the civic administrators of Broken Hill that the project was a success and a valuable public asset. Many critics must have been won over by her evocative and informative writing style. In 1944, citing ill-health, she moved to Sydney to live with her sister. She returned to Broken Hill on occasions to visit, lecture and attend meetings. Margaret died in 1957, just one year before the fencing of the entire regeneration area was completed.

### *Acceptance and resistance*

The 1941 New South Wales state election saw the Australian Labor Party and their leader William McKell defeat the more conservative United Australia Party government of Bertram Stevens, and this may also have helped to win over local support for the regeneration project. McKell took an interest in rural affairs, supported the introduction of the *Soil Conservation Act* (NSW, 1938) and regarded erosion management as an important issue (Cunneen 2012). Even so, undercurrents of resentment against the regeneration reserves must have still existed in Broken Hill.

In a 1942 report to the Broken Hill Council a reserves ranger described extensive vandalism. The *Barrier Daily Truth*, the other major Broken Hill newspaper and owned by the Barrier Industrial Council, a trade union body, responded to the report.

The paper acknowledged that the involvement of the mining companies in the creation of the reserves was a provocation to some citizens; the mining company executives didn't live in Broken Hill and had never experienced the full force of a dust storm. Nevertheless, the paper opined, the reserves brought benefits to the wider community, and should be respected ("Regeneration Areas", *Barrier Daily Truth*, p.2, 18 July, 1942).

Was the reported vandalism directed at the bosses? The July article appears to be an attempt to curb vandalism that was provoked by community antagonism towards the mining companies.

### *Drought and dust*

During the Second World War Broken Hill was subjected to prolonged periods of dry weather and drought. Only 1939 and 1942 achieved decent falls of rain: 1940-41 and 1943-45 were all years of low precipitation (Bureau of Meteorology). Terrible dust storms, originating from many kilometres away, ensued.

The dust was so thick on the ground that it was difficult for residents to even travel out of the city: "we are in actual fact Prisoners in the Great Dust Bowl of the Far West" ("Dust Bowl", *Barrier Daily Truth*, p.2, 17 October, 1944). A storm on Tuesday, the 30th of January, 1945, was described as being the worst ever experienced, with a total blackout of nearly an hour ("Dust", *Barrier Daily Truth*, p.2, 31 January, 1945). A combination of these extreme conditions, community dissatisfaction, the end of the War and the importance of Broken Hill as a source of mining revenue prompted the New South Wales government to further address the dust and sand issues.

## *6. Completion of the Broken Hill regeneration area: 1946-1958*

### *Politics*

New South Wales Premier William McKell visited Broken Hill in May, 1946 to inaugurate the construction of the Menindee to Broken Hill water pipeline. The regeneration reserves made a strong impression on him. He subsequently noted that they "showed up splendidly" against the rest of the barren landscape (McKell 1946). Margaret had predicted that the first set of good rains would revive them, and the excellent summer rains of January and February, 1946 had the desired effect (Bureau of Meteorology).

The dust and erosion problems of the city were brought to the Premier's attention by the mayor and

civic administrators. A dust abatement regeneration area with a 15 miles city radius was proposed (“We Must Demand”, *Barrier Miner*, p.3, 16 May, 1946).

McKell instructed his Minister for Conservation, George Weir, to arrange a regeneration conference in Broken Hill. Establishing some form of “Conservation or Regeneration Park” for the city was to head the agenda (McKell 1946).

The conference was set for October, and The Barrier Field Naturalists wasted no time in lobbying the Minister. Secretary May Harding invited him to address an unspecified form of meeting in Broken Hill on the subject of “regeneration or conservation”, at the time of the conference. The Minister declined (Harding 1946; Weir 1946).

The regeneration conference was held in Broken Hill on October 9, 1946. A wide range of commercial, political, community and special interest groups attended. Addressing the delegates, Minister Weir stated that the establishment of the pre-war regeneration reserves had demonstrated that natural vegetation would regenerate if stock was excluded. Constructing a fifteen miles deep regeneration strip around the city to reduce the dust problem was discussed. The formation of a Broken Hill Regeneration Committee was ratified (“First Steps”, *Barrier Daily Truth*, p.3, 10 October, 1946).

#### *Broken Hill regeneration committee*

The Barrier Industrial Council, the Graziers Association, the Chamber of Commerce, The Pastoralists Association, Broken Hill Council, the NSW Department of Conservation, the Mine Managers Association and other community and industry groups were granted representation on the Committee. The Barrier Field Naturalists opted for observer status.

The formal terms of reference permitted the Committee to look at ways and means to extend the existing pre-War regeneration area around the rest of the city in order to mitigate the dust and sand nuisance. Proposals to establish other regeneration reserves within a reasonable distance of Broken Hill could also be examined (“Initial Regeneration”, *Barrier Daily Truth*, p.4, 31 January, 1947).

The Committee met in January and August, 1947, with Margaret Morris attending the latter meeting. In February, 1948 Minister Weir approved its recommendation that a half-mile deep regeneration belt around the unprotected northern and eastern sections of Broken Hill should be created. The fencing would be stock-proof but not rabbit-proof (“Broken Hill”, *Barrier Daily Truth*, p.1, 24 February, 1948).

The proposal to create a fifteen miles wide regeneration belt was deferred pending further examination of the relevant land title issues. The possibility of having regeneration work done at Mundi Mundi Plains, located 30 kilometres to the west of Broken Hill and a suspected source of dust storms, was to be further investigated (“Broken Hill”, *Barrier Daily Truth*, p.1, 24 February, 1948).

There is no record of the latter two schemes being implemented. The indirect dust and erosion mitigating consequences of the release of Myoxma virus amongst the rabbit population in the nineteen-fifties may have influenced this outcome. Vested interests probably also played a role; the Pastoralists Association was not supportive of an expanded regeneration scheme. A splendid opportunity to revive the broader regional landscape was lost. Dust storms still torment the residents of Broken Hill.

*The final reserves of the regeneration area: 1951-58*

Work on the regeneration reserve between Kaolin Street (Nine Mile Rd) and Racecourse Rd commenced in October, 1950. In January, 1951, New South Wales Minister for Conservation Weir announced that the reserve was operational (“Regeneration Fence”, *Barrier Miner*, p.12, 27 October, 1950; “Regeneration Area”, *Barrier Daily Truth*, p.3, 29 January, 1951) (Figure 6). After several months of work by fencing contractors, Conservation Minister Enticknap announced in July, 1953, that the section of reserve between the Radio Station (Racecourse Road) and the road to Wilcannia (Barrier Highway), to the north-east of the city, was fenced (“Regeneration Area”, *Barrier Daily Truth*, p.4, 27 March, 1953; “Regeneration Area Fenced”, *Barrier Miner*, p.5, 4 July, 1953).



Figure 6. Mulga with saltbush in foreground of 1950-51 reserve.

(Photo: 2017 P. Ardill)

Fencing of the final regeneration reserve, enclosing the Menindee Road to South rifle club section, commenced in approximately July, 1958, and in October, 1958, Minister for Conservation Wetherell announced its completion ("Saving Of Our Silver City", *Sydney Morning Herald*, 17 June, 1958, Broken Hill Demonstration Supply File - Fencing File 60/1451. NSW State Archives. Kingswood, NSW; Wetherell 1958). The Broken Hill regeneration area was now fully operational.

The costs of fencing the last three reserves were met primarily by the New South Wales state government with Broken Hill City Council and the Mine Managers Association also contributing funds (Broken Hill Regeneration Area Demonstration Supply File. Fencing File. Item 60/1451. 1948-60. NSW State Archives. Kingswood. NSW). The reserves were declared a fauna sanctuary under the provisions of the *Fauna Protection Act*, NSW 1948, on December 5, 1958 (*Government Gazette NSW*, 5 December, 1958, Issue 122, p.3719).

## 7. Appraisal of the Broken Hill regeneration area

### *The regeneration technique*

Albert Morris's approach to ecological restoration was developed over eighty years ago. Similarities between the features of his approach and those of post-War New South Wales soil and native vegetation conservation research and bushland regeneration strategies may be discerned.

Since its formation in 1938 the New South Wales Soil Conservation Service has extensively surveyed land degradation in NSW and conducted research into soil and land restoration techniques. N.C.W. Beadle (1914-1988), who was to become an eminent soil conservation researcher and botanist, joined the Conservation Service in 1939 and conducted a survey of erosion in the Western Division. He developed an interest in the treatment of wind erosion and the resulting scalds. Stock exclosure, ploughing and the use of native plants to stabilise scalds were rangeland management techniques that he was investigating by 1940 ("Rapid Loss of Soil", *Farmer and Settler*, p.5, 18 July, 1940).

Albert would have enjoyed a chat with Beadle but it would appear to be the case that they never met. The latter probably first became acquainted with the initial Broken Hill regeneration area in 1939, as he visited Broken Hill when on a Linnean Society of New South Wales botanical expedition in 1939 (Whalley 2015). He lectured to the Barrier Field Naturalists Club in 1941 ("Story of A Seed", *Barrier Daily Truth*, p.3, 30 September, 1941).

In a September, 1946 report prepared for the forthcoming October Broken Hill regeneration conference, Beadle, who was unable to attend this conference, wrote:

*The existing regeneration reserves at Broken Hill have demonstrated that*

- (a) regeneration of the vegetation is possible;*
- (b) that regeneration is relatively rapid and*
- (c) that exclusion of stock minimises the sand-drift problem. (sic)*

Beadle felt that any future experiment with regeneration schemes and erosion control “should have as its prime object the estimation of the correct carrying capacity on range and treeless plains country” (Beadle 1946). Albert’s work had demonstrated to Beadle that in lieu of complete stock enclosure, an impractical proposition, determining appropriate stocking levels could alleviate the erosion problem, as the native arid zone vegetation possessed regeneration capacity.

In his landmark publication, *The Vegetation and Pastures of Western New South Wales*, Beadle acknowledged the success of Albert’s stock and rabbit exclusion policy and noted that the time required for successful vegetation recovery is related to the frequency of “good seasons”. He would have been aware of Albert’s advice to pastoralists to fence off a section of their properties in order to foster natural regeneration, as he cites Margaret Morris’s 1939 *Australian Journal of Science* article. Beadle also acknowledged Albert’s contribution to pre-Second World War ecology literature, citing Albert’s 1923 publication, *Flora Between the River Darling and Broken Hill* (Beadle 1948 pp.219, 82, 15).

It is reasonable to believe that the work of Albert Morris at Broken Hill did influence the development of Noel Beadle’s thoughts and ideas on erosion control. Certainly, Beadle is most acknowledging of the significance of the regeneration area project and its outcomes. The fact that Albert’s work was of interest to and was acknowledged by a professional researcher of Beadle’s stature favourably testifies as to its quality.

During the period c1950-70, at the Fowlers Gap research station, the Conservation Service experimented with the fencing of regeneration areas to study plant regeneration. The management of scalds by ripping and furrowing was investigated (Mabbutt 1973). As previously mentioned, stock enclosure, assisted seed dispersal and various furrowing methods, regeneration techniques bearing similarities to concepts that Albert was interested in, have also been extensively trialed by the Service (Green 1989).

The many similarities between Albert’s regeneration technique and that of the Soil Conservation Service does strongly suggest that the former’s work displayed, at the least, a significant degree of technical relevance to the remediation of erosion problems. The regeneration reserves may also have served as an interesting landscape restoration case study for other scientists and academics, as the scheme was successful in achieving specific outcomes, was formally documented in two science journals in 1939 and 1940 and was well publicised by Margaret Morris.

In the 1960s and ‘70s the sisters Joan (1916-1982) and Eileen (1911-1976) Bradley of Sydney pioneered the development of the modern Australian bush regeneration industry (Radi 1993). The specific regeneration technique that Albert developed, with its focus on prioritising the use of naturally occurring site features, would appear to be vindicated by the work of the Bradley’s and contemporary

bush regeneration industry practices.

The two regeneration movements share several restoration themes: preserving the natural site flora and a belief in its natural resilience and restorative capabilities, minimising site disturbance as much as possible and prioritising the use of other existing natural resources. The specialised nursery and plant propagation techniques that characterise today's industry are strongly reminiscent of the techniques that Albert developed and were employed by himself, Margaret and Jack Scougall.

As a matter of historical interest, there appears to be no current evidence to suggest that the development of the modern regeneration industry was directly influenced by the Broken Hill project. There is a reasonable chance that the Bradleys may have read of it in the Sydney media, where it was occasionally publicised. They may also have heard of the regeneration area via regeneration and botany associates. Even if they were aware of the Broken Hill project the Bradleys may not have recognised it as being a restoration project that bore similarities to their own bush regeneration work, as the main focus of the respective techniques differed: stock enclosure versus weeding.

However, the work of Albert Morris does share an important characteristic with that of the other early practitioners of Australian bush regeneration. Albert, Ambrose Crawford<sup>iv</sup> and Joan and Eileen Bradley sought to preserve particular ecological communities. They developed specific regeneration techniques that focused on achieving this goal. And this is why they are all recognised as being pioneers of the contemporary bush regeneration movement in Australia.

#### *Practical success*

The fundamental regeneration technique employed at Broken Hill was inherently simple: fence and protect. When applied to the Broken Hill sand-drift and localised dust problems, this uncomplicated approach produced benefits.

The regeneration project has proved to be a practical and historical success. It was relatively straightforward to implement and maintain. Complex and costly technical interventions were largely avoided. The possibility of catastrophic system failures was eliminated. The simplicity of technology allowed Broken Hill residents to access the regeneration area's benefits when they successfully lobbied for the creation of reserves in their own neighbourhoods.

The results have been tangible. Within a couple of years of implementation residents were aware of the beneficial results. Sand-drift encroachment is no longer an issue in the urban areas of Broken Hill.

As the technique and technology were devised with a view to utilising the features of the local landscape and climate, the regeneration area has proved to be resilient. Despite periods of extended dryness and severe drought the protected flora has persisted. The initial regeneration reserves have now persisted for eighty years of effective operation.

### *Ecological success*

Botanical success was certainly evident in the early years of the project (Morris, M. 1939c; Pidgeon & Ashby 1940). Margaret noted that fauna benefited: "Another result of the enclosures was the number of birds that took advantage of the sanctuary" ("Regeneration Areas", *Barrier Miner*, p.7, 30 September, 1939).

In March of 2016 the Society for Ecological Restoration Australasia published its *National Standards for the Practice of Ecological Restoration in Australia*. The National Standards detail six key principles that characterise best practice ecological restoration and maximise the chances of project success (Standards Reference Group SERA 2017). McDonald (2017a) has considered the question of whether the entire regeneration area qualifies as being a bona fide and high quality ecological regeneration project. Applying the National Standards, McDonald's short report concludes that the regeneration area can be regarded as an ecological restoration project that has progressed the recovery of Broken Hill's local indigenous vegetation communities to a substantial extent (McDonald 2017a) and reflects the National Standard's six key principles (McDonald 2017b in press).

### *Ethical restoration*

Naturally evolved landscapes display complexity, harmony, the stable functioning of the biotic community and aesthetic qualities (Leopold 1948). Accordingly, a restoration technique has merit when it establishes a high degree of continuity of these qualities between the original and the restored landscape and attempts to establish intrinsic, desired values in the restored landscape. Utilising a restorative activity that is "guided and structured by the designs of nature", it is possible to maintain "continuity with the natural past". Highly contrived restoration techniques that do not maintain continuity are of lesser merit (Elliot 1992 p.154).

Albert valued and wanted to preserve the varied life forms, knowledge and beauty of the Broken Hill region. His restoration technique did attempt to maintain continuity of qualities and desired values between the original landscape and the restoration site.

It enabled restoration of the flora, and created potential for the recovery of fauna and other ecological features and functions. This value preserving technique was applied to the creation of the entire regeneration area.

McDonald (2017a) reports that the reserves do represent relatively healthy ecosystems of their kind despite there being continuing symptoms of decline including reduced native species, particularly fauna,

and persistence of exotic pastoral plant species. The attempt at maintaining intrinsic, desired values appears to have achieved a considerable degree of success, as their qualities have persisted and are present.

### *Conclusion*

The degradation of the unique landscapes of far western New South Wales distressed Albert Morris. He was concerned about the constant sand-drift that threatened Broken Hill. By observation and experimentation Albert had developed an effective means of dealing with these issues by the commencement of 1936. In August, 1936, his determination and resourcefulness secured major investment in a regeneration area project of his own design.

Albert Morris identified precisely the correct regeneration technique that would restore the degraded landscapes around Broken Hill to a semblance of their former condition. As this technique was technically uncomplicated and well suited to the surrounding natural environment, the resultant regeneration area was a practical, ecological and ethical success.

Albert and the regeneration area project benefited from the substantial contribution of Margaret Morris and the contributions of Doctor William MacGillivray, Doctor Ian MacGillivray, Edmund Dow, Clarence Chadwick, May Harding and many other members of the Barrier Field Naturalists Club. A.J. Keast and Maurice Mawby were a formidable administrative partnering.

The Broken Hill regeneration area is a living tribute to Albert and his determination to implement his dream. He, Margaret Morris and their conservation minded partners were committed and successful restorers of life to the land.

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*Epilogue*

Doctor William MacGillivray (1933), Albert (1939), Edmund Dow (1944), Doctor Ian MacGillivray (1951) and Margaret (1957) all pre-deceased the completion of the construction of the entire regeneration area. Margaret must have gained some well-deserved satisfaction from knowing that the work would be done. The good news should have pleased scheme administrative supporters A.J. Keast (1892-1980) and Maurice Mawby (1904-1977). They both pursued prominent careers as senior executives in the Australian mining industry (Fairweather 1996; Strahan 2000).

May Harding (1908-1971), an active office-holder of the Barrier Field Naturalists Club for many years, pursued successful careers as a Broken Hill artist, botanist, conservationist and teacher (Lemon, 2000). Clarence Chadwick (1909-2004) achieved considerable repute as an entomologist (Anon. 2013).

The Barrier Field Naturalists Club is now approaching its one hundredth birthday. Broken Hill City Council, as trustee, continues to administer the regeneration area. Members of Landcare Broken Hill undertake voluntary flora and weed maintenance work there on a regular basis.

The regeneration reserves are classified by the National Trust (NSW) as an essential cultural item of the City of Broken Hill. In 2015 the entire city was declared a place of National Heritage values by the Australian government and was entered in the National Heritage List. The accompanying Schedule to the List records Albert's achievements and the actual regeneration area as heritage values of the city.

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I hope that this essay closely reflects the truth of how the Broken Hill regeneration area and associated projects there came into being and all errors are my responsibility. The opinions expressed are mine and do not necessarily represent those of the Australian Association of Bush Regenerators.

Peter J. Ardill  
July 2017

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## APPENDIX A

### THE BROKEN HILL PLANTATIONS, RESERVOIRS REGENERATION PROJECT & THE BROKEN HILL REGENERATION AREA 1935-58: A CHRONOLOGY

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The three main projects:

- A. Plantations No.1 & No.2 (1936 – approx.1938): predominantly planting of trees.
  - B. The reservoirs regeneration project (1936-39): fencing of Waterworks Hill and Block 10 Hill in Broken Hill to allow natural regeneration of native vegetation.
  - C. Broken Hill regeneration area (1936-1958): fencing of regeneration reserves in Broken Hill before and after the Second World War (1939-1945) to allow natural regeneration of native vegetation.
- 

## SUMMARY

### A. PRE-SECOND WORLD WAR.

1936 May 9. Morris, Keast and Mawby meet to discuss the construction of a tree plantation to control sand-drift near the new Zinc Corp mine.

1936 May 18. Announcement made that a tree plantation will be built near the new Zinc Corp mine and work on fencing has commenced.

1936 May 25. AJ Keast announces the construction of the new Zinc Corp mine complex in south-east Broken Hill.

1936 May 27. Albert Morris and Barrier Field Naturalists Club initiate the reservoir regeneration project.

1936 September 7. Announcement made that an experimental half-mile wide and rabbit-proof fenced strip of land (regeneration reserves) will be built between old South racecourse and Broken Hill Cemetery to allow natural regeneration and so control sand-drift.

1937 February. The first set of regeneration reserves of the pre-Second World War Broken Hill regeneration area, from old South racecourse to the Cemetery and old Silverton Tramway, is completed.

1937 August-September. The regeneration reserve between old South racecourse and Bonanza St is completed.

1937 September. NSW government approves and agrees to fund fencing of Waterworks Hill and Block 10 Hill reservoirs regeneration project.

1938 March. The set of regeneration reserves between the Cemetery and Nine Mile Rd is completed.

1939 March. The regeneration reserve from Bonanza St. to South rifle range is completed.

1939 April. Fencing of Waterworks Hill and Block 10 Hill reservoirs regeneration project is completed.

#### **B. POST-SECOND WORLD WAR.**

1946 October. Broken Hill Regeneration Committee is established.

1948 February. NSW Minister for Conservation approves construction of further regeneration reserves for the Broken Hill regeneration area.

1951 January. NSW Minister for Conservation announces that construction of the regeneration reserve between Kaolin St. and Racecourse Rd has been completed.

1953 July. NSW Minister for Conservation announces that construction of the regeneration reserve between Racecourse Rd – Radio Station and Wilcannia Rd has been completed.

1958 October. NSW Minister for Conservation announces that construction of the regeneration reserve between Menindee Rd and South rifle range has been completed and the Broken Hill regeneration area now fully encircles Broken Hill.

## FULL CHRONOLOGY

### THE BROKEN HILL PLANTATIONS, RESERVOIRS REGENERATION PROJECT & THE BROKEN HILL REGENERATION AREA 1935-58: A CHRONOLOGY

#### 1935

October-November approx.

- Albert Morris and the Barrier Field Naturalists write to the New South Wales state government and recommend that an area of the public common be fenced, with the intention of excluding stock and allowing natural vegetation to regenerate.

#### 1936

April

- Albert Morris presents a submission to the New South Wales Erosion Committee and recommends that pastoralists fence off sections of their properties to exclude stock and allow native fodder plants to grow undisturbed and so facilitate the natural distribution of seed.

May 9

- A.J. Keast, M. Mawby and Albert Morris meet to discuss the construction of a tree plantation to protect the proposed new Zinc Corporation mine works from drifting sand.
- Morris agrees to assist with the provision of resources and advice.

May 18

- An announcement is made that a plantation (Plantation No.1) will be built to protect the proposed Zinc Corporation Mine. The plantation will use native

trees suitable to local conditions. Work on this plantation has commenced. A six foot (2 metres) galvanised iron fence will enclose the plantation. A saltbush hedge will be grown inside it. A plant nursery will be established. The plantation will be 10-12 acres; *And*<sup>v</sup>

- Plantation No.1 (aka Albert Morris Park, Zinc/Twin Lakes Park) is about 20 acres with a galvanised iron fence on three sides and a rabbit-proof wire mesh fence on the side nearest the mine works; *And*
- No. 1 Plantation is about 22 acres on the south-west side of the new mine works, with a tank on the highest point for gravitational watering. The fence is topped with barbed wire. Iron fences are on two sides and the balance is rabbit-proof.

May 25

- A.J. Keast announces the construction of a new three-storey mine complex for the Zinc Corporation. Demolition of the old buildings will commence immediately and construction of the new mine buildings will take about two years.

May 27

- Albert Morris and the Barrier Field Naturalists Club initiate the reservoirs regeneration project and resolve to write to the NSW government to secure approval and financing for the fencing of Waterworks Hill and Block 10 Hill reservoirs land in Broken Hill.

May to August

- Plantation No. 1 is fenced and native grasses regenerate inside it, as predicted by Albert Morris.

August

- Using this evidence of site regeneration potential Albert Morris approaches AJ Keast of Zinc Corporation and obtains approval for the construction of the first set of regeneration reserves of the pre-Second World War Broken Hill regeneration area.

August 27

- Broken Hill Council approves the fencing of sections of the common in order to create the first set of regeneration reserves.

September 7

- Mr. Fairweather of the Mine Managers Association announces a plan by North, South and Zinc Corp mines to experiment with sand-drift control by enclosing a strip of land half a mile wide with a rabbit-proof fence (regeneration reserves) which would stretch from the old South racecourse to the Cemetery and the Silverton Tramway line.

October

- Planting in Plantation No. 1 commences with 1000 Old Man Saltbush.

November

- The proposed series of regeneration reserves from old South racecourse to the Cemetery have been surveyed and the fencing of them has progressed from the old South racecourse to the city Abattoir.

**1937**

January 9

- Five hundred saltbushes are planted outside the iron fence of Plantation No.1, in the adjoining regeneration area reserve, which is now fenced to exclude stock; *And*

January

- The regeneration reserve immediately behind Plantation No.1 (Albert Morris Park) is ploughed in 50 yards squares to break up scalds and to allow seed to collect and germinate, and over 1000 saltbushes and 750 trees are planted (Note: most likely from January to December, 1937). Seed is scattered in this area (Note: at some time in 1937); *And*
- The regeneration reserve behind Plantation No.1 (aka Albert Morris Park, Zinc/Twin Lakes Park) is irrigated and planted in the same way as the park (Note: most likely from January and throughout 1937).
- Tree planting commences in Plantation No.1 (aka Albert Morris Park, Zinc/Twin Lakes Park). Eventually approximately 2500 trees are planted in this park; *And*
- In Albert Morris Park (aka Plantation No.1, Zinc/Twin Lakes Park) River Red Gums are planted. Fifteen different kinds of trees are used and 60-90 trees

are planted and staked each day. By the end of January 1188 trees have been planted in Albert Morris Park (aka Plantation No.1, Zinc/Twin Lakes Park), with planting continuing for some months.

February approx.

- Fencing of other areas of the mine lease (Plantation No.2) is completed and general beautification of the Zinc Corporation lease is carried out around the mine cottages, Manager's residence and the Guest House, with avenues of trees on the main roads. A wide range of plants is used; *And*
- A second plantation (Plantation No.2) is created at the front and back of the cottages on the Railway Town side (north) and South Broken Hill side of the mine (Note: exact date unspecified but approx. Feb 1937).

February

- The fencing of the first set of regeneration reserves of the pre-War Broken Hill regeneration area is completed. They stretch from the old South racecourse in South Broken Hill north-westwards to the Cemetery and Silverton tramway. There were 5 of these reserves.

June 18

- The South Australian Soil Erosion Committee (Chairman: W.J. Spafford) tours the plantations and fenced regeneration reserves with Albert Morris and E.B. Dow. The Committee meets Dr I. MacGillivray and A.J. Keast.
- Spafford is very impressed and recommends extending the first set of regeneration reserves south past the old racecourse area towards Bonanza St. (airport rd.).
- The regeneration reserves are declared NSW state flora reserves.

August

- Work on the regeneration reserve extension from old South racecourse to Bonanza St. (airport rd.) is well advanced and is expected to be completed in September.
- The mining companies also wish to extend the regeneration reserves from the Cemetery and Silverton tramway west and northwards to Nine Mile Rd.,

and Council is expected to agree to this at its next meeting.

- A.J. Keast comments that recent rains will encourage good growth in the regeneration reserves and that he is pleased with the results so far.

September 17

- NSW government approves the fencing component of Waterworks Hill and Block 10 Hill reservoirs regeneration project in Broken Hill for the purposes of natural regeneration.

December

- Work commences to extend the regeneration reserves from the Cemetery and Silverton tramway further around the western and north-western perimeter of the city, past the Silverton Road and to Nine Mile Rd.

**1938**

February

- A.J. Keast expects the regeneration reserves extension around the western and north-western perimeter of the city, in the Silverton road and Nine Mile Rd area, to be finished by March.
- Announced that complete encirclement of the city with regeneration reserves will not take place until the success of the scheme is definite.

March

- The Zinc Corporation sponsored beautification scheme in the Cemetery commences.

March 25

- The regeneration reserves are strictly protected under the regulations of the newly published Broken Hill Council by-laws. Public access is prohibited. Albert Morris, Jack Scougall, Maurice Mawby and three others are appointed rangers.

July-September approx.

- All of the regeneration reserves have been left to regenerate naturally with the exception of the reserve adjacent to Plantation No. 1, which has been ploughed and planted to some extent, as noted.

September-November

- Albert Morris is diagnosed with a serious medical condition, receives treatment in Adelaide and returns to Broken Hill, where he is hospitalised.

December

- Work commences on the construction of the regeneration reserve between Bonanza St (airport rd.) and South rifle range.

## 1939

January 9

- Death of Albert Morris.
- In a tribute, A.J. Keast, Manager of the Zinc Corporation mine, gives Albert complete credit for the establishment of the two plantations and the regeneration reserves of the pre-War Broken Hill regeneration area.

March

- Fencing of the regeneration reserve from Bonanza St to South rifle range is finished and the pre-War Broken Hill regeneration area is completed.

April approx.

- Fencing of the Waterworks Hill and Block 10 Hill reservoirs sites for the purposes of regeneration is completed.

September

- By this time several regeneration reserves have had some planting done in them by various progress associations.
- Seed has also been scattered in some regeneration reserves, and other reserves have been left untouched.
- As noted the regeneration reserve behind Albert Morris Park has been

extensively planted and is irrigated in a similar way to the park.

#### 1940-44

- Second World War (1939-45).
- No further construction of Broken Hill regeneration reserves during this period.
- Severe drought and many dry years. Large dust storms in Broken Hill.

#### 1945

October

- Work has commenced on the construction of Zinc-Twin Lakes in Albert Morris Park, formerly Plantation No.1. Some trees will have to be removed. Completion by Xmas is anticipated.

#### 1946

May 10-14

- NSW Premier McKell visits Broken Hill and is lobbied by the Broken Hill Mayor and city administrators to create a larger regeneration area in order to manage the regional dust storm issue.

October 9.

- The Broken Hill Regeneration Conference is held and the Broken Hill Regeneration Committee is formed.

#### 1947

September

- New Broken Hill Consolidated mining company announces construction of a new mine complex in the regeneration reserve adjoining Zinc/Twin Lakes Park (Plantation No.1; Albert Morris Park) and immediately west of Wentworth Rd. This regeneration reserve is heavily modified with the construction of a plantation and orchard, mine buildings and cottages.

**1948**

February

- NSW Minister for Conservation Weir approves the Regeneration Committee recommendation to establish more regeneration reserves to the north and east of the city and so fully encircle the city with an extended regeneration area.

**1951**

January 29

- NSW Conservation Minister Weir announces that the fencing of the regeneration reserve from Kaolin St. to Racecourse Rd has been completed.

**1953**

July 3

- NSW Conservation Minister Enticknap announces that the regeneration reserve from the Radio Station (Racecourse Rd) to Wilcannia Rd has been completed.

**1957**

- Death of Margaret Morris in Sydney.

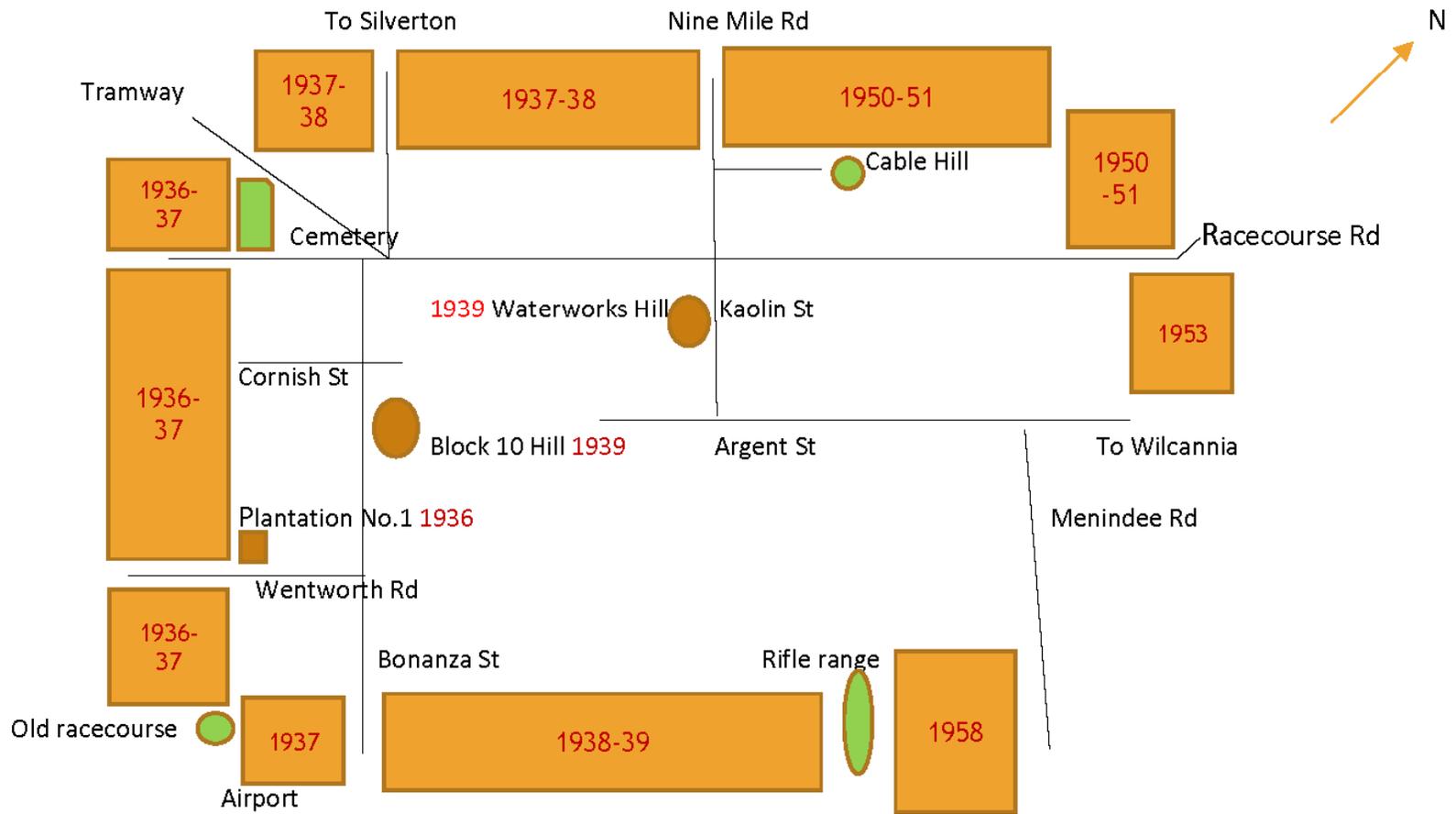
**1958**

October 15

- NSW Conservation Minister Wetherell announces that the final regeneration reserve between Menindee Rd and the South rifle range has been fenced and the city of Broken Hill is fully encircled by the pre-War and post-War regeneration reserves. These reserves are now known collectively as the Broken Hill regeneration area.

**APPENDIX B - MAP**

**Plantation No.1, reservoirs project, sets of regeneration reserves: 1936-58** [Not to scale]



End-notes.

<sup>i</sup>. Accredited member, Australian Association Bush Regenerators (AABR). P\_A\_7@BIGPOND.COM

<sup>ii</sup> Dr Tein McDonald, President, Australian Association of Bush Regenerators, provided opinion and discussion notes on the importance of *intention* in a restoration activity.

<sup>iii</sup>In order to create a more extensive picture of an event or site more than one historical account of it may be presented. The details of each account may vary.

<sup>iv</sup> In 1935 Ambrose Crawford commenced restoring and conserving a section of the Big Scrub, Lumley Park, on the New South Wales north coast. Documentation provided by Australian restorationist Dr. Tein McDonald and cited in Jordan & Lubick (2011) pp.72-73.

<sup>v</sup>Alternative versions of the same event are presented. This is indicated by *And*

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