

Five Decades of Watching Mound Springs in South Australia

Colin Harris¹

Abstract

Australia's mound springs, or artesian springs as they are more generically known, are natural outlets for the pressurised ground waters of the Great Artesian Basin (GAB) and occur in the far north of South Australia, north-western New South Wales, and western and south-western inland regions of Queensland. The springs in South Australia are aligned in a great arc around the southern and south-western margins of the GAB and are particularly well developed near Lake Eyre and at Dalhousie Springs north-east of Oodnadatta. It has been my good fortune to have been closely associated with the South Australian springs for five decades, both professionally and in a personal capacity, and in this paper I reflect on those five decades and what they might offer in terms of managing the springs more effectively into the future.

Keywords: Great Artesian Basin springs, South Australia, cultural and environmental importance, conservation initiatives, management issues, involvement of Indigenous people

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Introduction

I saw my first mound spring in 1971, but my interest had been piqued much earlier. In the mid-1950s I was in primary school and my attention had been drawn to an intriguing photograph in a South Australian Social Studies textbook. It was the impressive sand bubble of the Bubbler mound spring near Lake Eyre South, and the accompanying text described the mound springs as one of the wonders of the Australian Inland (Education Department SA, 1955). To an impressionable young boy the notion of freshwater springs in an otherwise harsh desert environment did indeed seem a wondrous thing.

I made a mental note to visit these oases in the desert, and when the opportunity came some fifteen or so years later, it was, felicitously enough, the Bubbler and nearby Blanche Cup Springs that I first visited. They were every bit as intriguing as the writer of that textbook had suggested, and a year later I was back, this time to the spectacular Dalhousie Springs on the western margins of the

Simpson Desert (Figure 1). Shortly after, I was recruited to the newly established South Australian Environment Department where for thirty years mound springs and the GAB were an important part of my work program. In retirement I joined with a group of like-minded colleagues and friends to establish the community group Friends of Mound Springs (FOMS), and in spite of our advancing years we remain active in the conservation of springs in South Australia.

What all this amounts to is five decades of watching springs in northern South Australia. There have been many changes in that time, some for the better, some not, and the observations and thoughts that I have garnered may provide some pointers to how springs might be managed more effectively.

The Early Years, 1970s

At the time that I made my first visit to South Australia's springs country, there was quite a deal of public interest in the centenary of the Overland

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Telegraph Line (OT), one of the most remarkable technological achievements of 19th-century colonial Australia (Taylor, 1980; Moyal, 1984). With its completion in 1872, Australia could communicate almost instantaneously with the rest of the Western World, a far cry from ship-borne communications which could take many months. Construction of the OT had been made possible by the inland explorations a decade or so earlier of John McDouall Stuart (Stuart, 1865), the route that Stuart took on his successful crossing of the continent in 1861–1862 becoming, with only minor deviations, the route of the OT. In turn, Stuart had succeeded in his crossing because of the great arc of mound springs to the south and west of Lake Eyre. Providing potable water in some of the harshest desert country in Australia, the springs were the stepping stones that led him into central and northern Australia, and ultimately to the Arafura Sea and back.

Pastoralists had followed hard on the heels of Stuart, his reports of unending waters being an irresistible attraction, and when the narrow-gauge railway line north to Oodnadatta began creeping its way inland a decade or so after the OT line,

an important trade and communications corridor had been established along the line of the springs (Figure 2). It was a remarkable nexus between the natural and cultural: the springs had determined the line of Stuart's explorations, the pastoralists followed and located their head stations on the springs, the OT followed a decade later (with the Strangways and Peake Repeater Stations located on the springs), and in the 1880s and early 1890s the railway pushed northwards to service the pastoral industry (Harris, 2002). Importantly though, all of this was simply a European manifestation of what Indigenous people such as the Arabana and Lower Southern Arrernte had been doing for millennia. The line of springs was a key trade and communications route for them, continent-wide song lines followed their path, and individual springs were of both utilitarian and mythological importance (McBryde, 1987). While they were supremely utilitarian in providing unending sources of water in dry times, when it came to the mythological they were not simply way-points in dreaming travels, but key sites where significant events had happened (Hercus, 1980).

Figure 1. Great Artesian Basin, principal areas of spring activity. Modified from Habermehl (1980) and Ponder (1986).

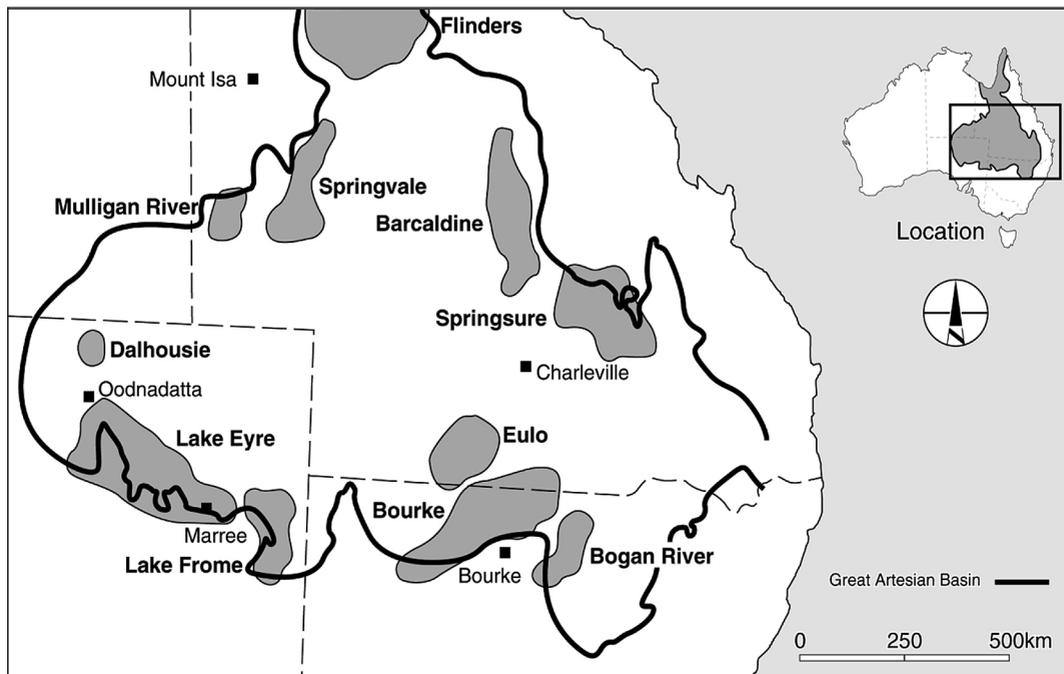
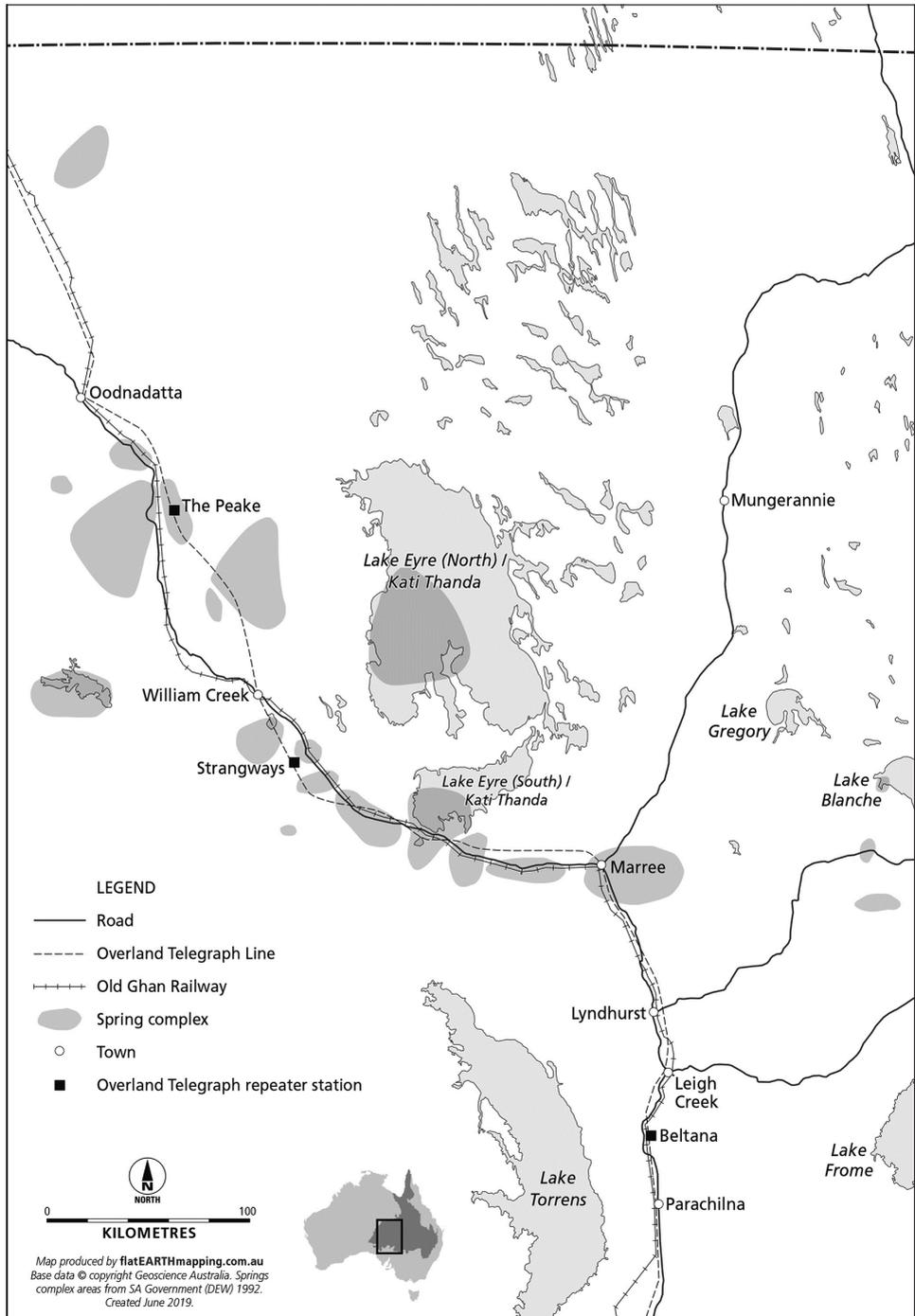


Figure 2. Mound springs and associated cultural features.



All of this had drawn me to the country in that initial visit of 1971, but other opportunities to visit soon followed. I was involved in post-graduate biogeography studies at the University of Adelaide at the time, and just over a year later (1972) I found myself at Dalhousie Springs with a group of scientists from Adelaide and the Australian National University (ANU) Canberra en route to the Simpson Desert. The Desert was the principal focus at the time, but the group of botanists, biologists and earth scientists put in several days around the sixty or so flowing springs. Some interesting findings emerged, particularly from the work of the late Dr Dick Barwick (ANU) who looked at ecological partitioning in the springs and the importance of thermoclines in the distribution of the (native) fish species. Regrettably, the latter work was not published; it would have been of importance in influencing a later decision of the South Australian Government to establish a major camping facility at the main spring. Swimming is allowed in the spring, and I have often wondered about the consequences of all that human activity in breaking down the previously well-defined thermoclines.

Early SA Government Work

A little over a year later (1973) I was part of the first intake of environmental officers to the newly established State Government Environment Department, and in one of those strange twists I was given a starting date that involved not reporting to the office, but instead rolling my swag and joining an inter-departmental party of State Government officials on a two-week inspection of the Marree-Oodnadatta country. Many of the key mound springs were included in the inspection, and professional and personal friendships developed from those first two weeks in the outback were to be of key importance in the later development of a conservation program for the springs.

One of the things that emerged from the inspection was that hydrogeologists in the South Australian Department of Mines already had a program under way to systematically record the location, flows and water chemistry of the springs. This work – continued over a period of some years in the 1970s – is now an important baseline inventory, poignant in some ways because it records flows from springs that are now, only a few decades on, extinct (Williams,

1974, 1979; Cobb, 1975). Tony Williams, who was involved in that work, also collaborated with John Holmes of Flinders University in a pioneering study that looked at using the areal extent of wetland vegetation as a surrogate for spring flow (Williams & Holmes, 1978). Interest in this methodology remains to the present, with satellite imagery being used to capture the ebb and flow of wetland areas around the springs. The Mines Department was also taking an interest in uncontrolled flowing bores, and in the late 1970s (well before the Great Artesian Basin Sustainability Initiative) it commenced a rehabilitation program (Boucat & Beal, 1977). To its credit, the Department recognised that a number of uncontrolled bores had been flowing for many years, creating wetlands of biodiversity interest. With this in mind it invited the State Environment Department to assess these wetlands before any rehabilitation was undertaken, and the outcome was agreement that at a number of bores a controlled flow would be maintained, albeit supporting smaller wetlands than those around the uncontrolled flows. Several decades on, the Great Artesian Basin Sustainability Initiative (GABSI) would provide a national framework and funding for bore rehabilitation work, and the recovery of local aquifer pressures was seen to be an important step in maintaining, and even recovering some spring flows.

Assessing the flowing bores also meant assessing a number of nearby or adjacent springs, a major perceived benefit of the bore rehabilitation being that a recovery of localised groundwater pressures would result in some recovery of spring flows, and in 1979 the State Environment Department released its first report on mound springs (Casperson, 1979). Even at that early stage the report documented high scientific and cultural values for the springs, foreshadowed further and more detailed studies, and raised the need for conservation measures such as stock-proof fencing at selected springs. I was a middle-level Manager in the Department by this time, and the mound springs work was being done under my direction. Perhaps unusually by Government conventions today, I was also active in a non-government organisation, the Nature Conservation Society of South Australia. The Society had a reputation for conducting sound biological surveys, and in view of the rising interest in springs it decided that the mound springs country between

Marree and Oodnadatta would be the survey region for 1978. In spite of the remoteness, the Society assembled a strong team, and over a ten-day period up to thirty biologists, earth scientists and field naturalists participated, supported by a dozen 4WD vehicles and two light aircraft. Amongst the highlights were the rediscovery of the salt pipewort, *Eriocaulon carsonii*, a plant endemic to the springs, and the collection of a new species of ostracod, *Ngarawa dirga* (Greenslade et al., 1985). It was an important contribution to our understanding of the springs, and although a compilation of the collected results did not appear for some time, much of the data was pressed into immediate use, both within and outside of government.

A Rapid Growth of Interest – Olympic Dam Mine

Even with this rising tide of interest, relatively few people knew of the springs, and it would be safe to say that even fewer were concerned about their conservation status. All of this was about to change, however, for by the late 1970s it had become clear that mineral exploration to the west of Lake Torrens, in a region known to geologists as the Stuart Shelf, had confirmed the presence of an ore body with world-ranking quantities of copper (fourth largest in the world), uranium (largest in the world), silver, gold (fourth largest in the world) and rare earth elements (Showers, 1999; Johns, 2010). Western Mining Corporation, the company that had made the discovery, subsequently entered into a joint venture arrangement (1979) with BP Australia to develop the prospect, and in the early 1980s the joint venture commissioned studies for a draft environmental impact statement.

From the outset, what had become known as the Olympic Dam Mine proposal attracted considerable interest and controversy. Whilst there was plenty of support for the predicted economic stimulus a mine at that scale would bring for South Australia, there was also plenty of opposition. The opposition focused on two main concerns: South Australia's prospective involvement in the nuclear cycle, which many people were passionately opposed to; and the proposed extraction of up to 32 megalitres (ML) of water a day from the GAB for process water at the mine and its treatment plants, and for the support town of Roxby Downs to be located near

the mine. Whilst the proposed mine and its infrastructure were located around 100 kilometres from the southern margins of the GAB, the extraction of GAB water was to take place (initially) near Lake Eyre South, from where it would be pumped south (Kinhill-Stearns Roger, 1982). Borefield A, where the production bores would be located, had many mound springs in close proximity, and the localised drop in pressure that would result from the water extraction raised many legitimate concerns about impacts on the springs.

In spite of the opposition, including a regional presence of anti-uranium protesters for several years, environmental, social and economic studies were eventually concluded, the mine approved, and an opening site ceremony conducted on 5 November 1988. Mining continues to the present, although now under the ownership of BHP. Expansion plans are frequently mooted, and the projected life of the mine is widely accepted to be many decades. Around 42 ML of GAB water is now being used for the mining operation daily. This water is principally being extracted from Borefield B, which was established in the late 1990s to the east of Lake Eyre North, but with some extraction from the original Borefield A – all of which understates the high politics, the contention and the controversy that the project generated.

Although environmental impact assessment was not part of my departmental brief, I knew the springs well by that time and I became involved in much of the Olympic Dam environmental impact statement (EIS) work, particularly when it came to GAB extractions and the likely spring impacts. The backdrop to the work was the political intensity of the whole issue, and I was variously described by opposing camps at the time as a mouthpiece for the conservation movement and an apologist for industry. Offsetting all this high drama was the fact that in the course of it all I had the good fortune to become acquainted with some outstanding scientists, including Dr Rien Habermehl of the then Bureau of Mineral Resources Canberra, at that time Australia's pre-eminent GAB hydrogeologist; Dr Winston Ponder from the Australian Museum, an expert on freshwater tateids – of which there are many new and endemic genera and species in the springs; his colleague Dr Wolfgang Zeidler from the SA Museum; and the late Dr Luise Hercus,

a linguist from the ANU Canberra and an outstanding authority on the importance of the springs to Indigenous Australians. All have added a great deal to our understanding of the springs, and their contributions to the EIS work of the early to mid-1980s were highly important.

SA State Government Initiatives

At the same time that the EIS work was under way, the South Australian Environment Department was becoming much more actively involved in its own studies of the springs, paradoxically enough because of the perceived threat from the Olympic Dam mine proposal. It was more than a little ironical that it had taken an external threat to stimulate the flow of funds, but those of us committed to conservation of the springs were not too concerned about such things. We welcomed the investment and, with Commonwealth funding available to bolster State contributions, four important consultancy studies were commissioned and undertaken in 1984–1985: one dealt with the biological values of the springs, a second surveyed the archaeology of the springs, a third the cultural significance of the springs to Indigenous people, and the final report documented their non-Indigenous (principally, though not exclusively, European) heritage values (SADEP, 1986). The archaeological work, although necessarily brief, was the first of its kind to be undertaken in the region, and the non-Indigenous settlement history became a basis for the subsequent State Heritage listing of a number of significant sites and objects along the Oodnadatta Track.

The biological survey was always going to be challenging because of the areal extent of the springs and the difficulties of ground access to them in quite remote country. The survey became even more challenging when heavy rains closed many roads and tracks before work had even begun. Fortunately, however, the Commonwealth Government stepped in with additional funding to cover helicopter charter costs, and this proved to be a very rapid and effective way of reaching springs. Far more were sampled than would have been possible under the original plan to use ground access. The Indigenous cultural assessment was largely desktop, but extremely effective and important because it gathered together information that Luise Hercus had been recording from traditional

Indigenous custodians, her many field trips to the region having begun in the late 1960s. It remains to the present the definitive work on the Indigenous cultural heritage of the springs (SADEP, 1986).

The South Australian Environment Department had two main reasons for commissioning these surveys: first, to place the Olympic Dam EIS work being done by the joint venture partners into a broader regional context; and second, to establish some priorities for springs to be fenced on pastoral lease country. In a Presidential address that I had delivered to the Royal Geographical Society of Australasia (SA Branch) Inc. in 1981, I had identified fencing of selected high-priority springs as the single most important conservation initiative needed at that time (Harris, 1981), and with completion of the surveys we set about obtaining funding for this, mostly Commonwealth, though with some private sector and non-government contributions. The statutory body responsible for pastoral country in South Australia, the Pastoral Board, then facilitated negotiations with the pastoral lessees involved, and by late 1988 ten springs had been fenced against cattle and feral donkeys and horses. The fencing was constructed to a high standard, and over thirty years later the enclosures remain intact (Figure 3). Partly because of funding constraints and partly because some lessees wanted continued access to water from the springs, the enclosures are small, ranging in size from 0.1 ha to 9.2 ha. Some biologists criticised the fencing initiative, arguing that a lesser number of enclosures, but with a greater number of spring vents and tails within each one, would have provided greater biodiversity (Fatchen, 2000). In the light of what we now know about springs biology and biogeography, that is true; but at the time it seemed a reasonable decision, especially as the choice of springs was also influenced by both Indigenous and non-Indigenous cultural heritage values. Our intent was to fence as many high-priority springs as possible.

We were also criticised because of the very rapid proliferation of *Phragmites australis*, and to a lesser extent *Typha domingensis* within the enclosures in the wake of the cessation of grazing. The concern was focused on the competitive effect of this on other plants associated with the springs and the loss of open pools of water known to provide habitat for a range of invertebrates, some endemic

to particular springs or spring complexes (Fatchen, 2000). In a 1992 paper reviewing the South Australian springs initiatives, I addressed this in part by posing the question of floristic dynamics in the pre-European grazing environment (Harris, 1992). Whilst megafauna such as the *Diprotodon* would have undoubtedly grazed the springs vegetation, that grazing ceased around 35,000–40,000 years ago and there are numerous references to dense *Phragmites* in early European accounts of the springs. The accompanying sketch of Louden

Spa (north of present-day William Creek) dates from John McDouall Stuart’s exploration, and the dense, high growth of *Phragmites* is particularly interesting in this context (Figure 4). It is also the case that after thirty years of protection from grazing, the *Phragmites* in some of the exclosures is beginning to senesce, presumably as the high stock-induced loadings of nutrients decline over time. A more detailed consideration of *Phragmites* and the springs is the subject of the paper by Lewis and Packer (2020).

Figure 3. Mound springs – conservation parks and fenced springs. Bolding indicates fenced springs.

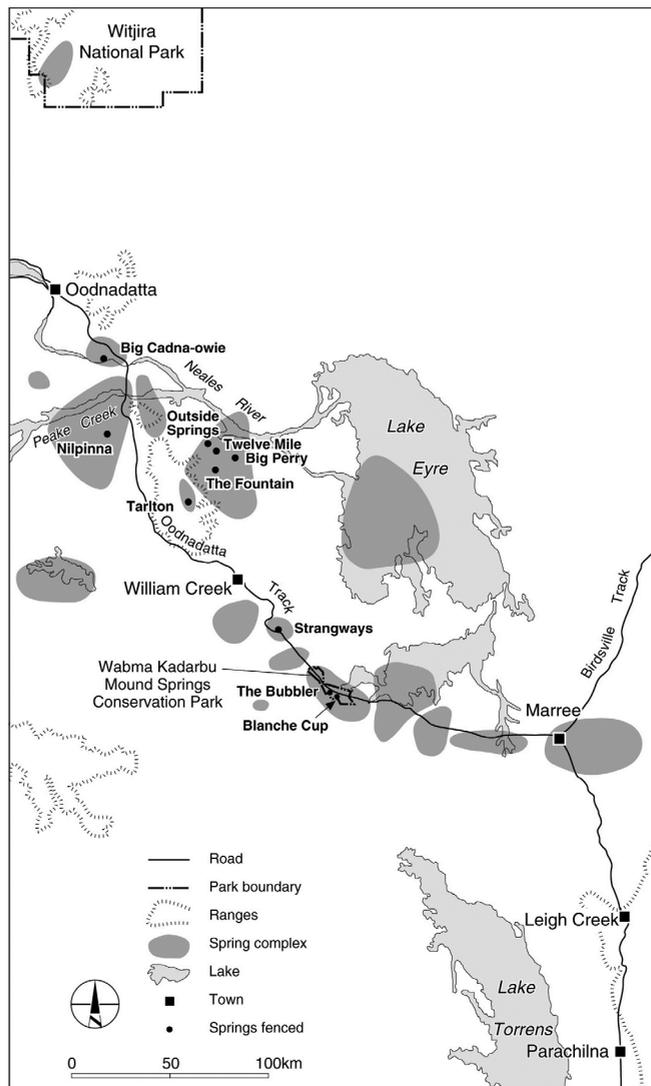


Figure 4. Louden Spa, showing high and dense *Phragmites* growth. *Source:* GF Angas, based on sketches from McDouall Stuart expeditions, 1859–1862 (Stuart, 1865). Some care is needed as Angas had not seen the country and there may be some artistic licence in his portrayal of the reed growth. This spring ceased to flow in the 1970s and is now extinct (*Source:* National Library of Australia, nla.pican22891603-v).



Establishment of Witjira and Wabma Kadarbu Parks

At the same time that the departmental surveys of the springs were being undertaken, Dr Winston Ponder and Dr Wolfgang Zeidler, two of the key scientists previously mentioned in the context of the Olympic Dam EIS, initiated an independent study of Dalhousie Springs. Funded by the invited participants, the survey was conducted in June 1985 and the results were published several years later (Zeidler & Ponder, 1989). Coincidentally, and prior to the Dalhousie survey, an opportunity had arisen to establish the first protected area under the *National Parks and Wildlife Act 1972*, specifically for springs conservation. The acquisition of Mt Dare station to protect Dalhousie Springs had been mooted as early as 1970, but at the time the lessee, Rex Lowe, was unwilling to sell and the Government of the day was not prepared to resume the lease. By the mid-1980s, however, that situation had changed and, with Lowe as a willing seller, negotiation and acquisition proceeded quickly,

with the 7769 square kilometre Witjira National Park constituted in 1985 (Cohen, 1989) (Figure 3). While the establishment of the park removed cattle grazing from the springs, it also opened them to tourism. Lowe had actively discouraged visitors to the springs, but once in the public domain the situation changed dramatically, especially as 4WD Simpson Desert crossings increased in popularity. A formal campground at the main spring now functions as the most frequently used gateway to the Desert, its warm waters a widely publicised attraction. Although I had been actively involved within the Department in the acquisition of Witjira, I was opposed to the later development of the campground, believing that the endemic native fish and invertebrates were too important to be subject to such heavy visitor pressure, particularly in the light of the thermoclines and ecological partitioning mentioned earlier in this paper. It was an internal debate that I lost, but it remains my belief that camping should be away from the springs, with the main springs a day-visit site with no swimming.

A second park specifically for mound springs conservation was established a decade later near Lake Eyre South. Embracing the Blanche Cup and Bubbler Springs on the Oodnadatta Track – long regarded as classic mound springs because of their morphology and flow – it was constituted in 1996 and with a later extension is now the 12,016 ha Wabma Kadarbu Mound Springs Conservation Park. Unlike the situation at Dalhousie Springs, it is a day-visit park with no camping and swimming; camping facilities are provided at the nearby, privately operated Coward Springs Campground.

The completion of comprehensive springs surveys, the establishment of the two parks and the stock-proof fencing of a number of key springs represented some substantial progress, and in my 1992 paper I had reflected on improvements for the better in the decade following my 1981 review (albeit that Wabma Kadarbu Mound Springs Conservation Park had not been established at that stage). Within the Department our attention at this time was primarily focused on managing the two parks and monitoring the fenced exclosures as the springs vegetation responded to the relaxation of decades of livestock grazing pressure.

Through all of this over many years, we received a great deal of invaluable advice and support from the traditional owners of the land, the Arabana in the Marree-Oodnadatta country and the Southern Arrernte at Witjira. It was both a privilege and a pleasure for me to work with Arabana elders at sites along the Oodnadatta Track; and to become acquainted with senior custodians of Southern Arrernte traditions and law at Witjira. In 2007 the Witjira National Park Co-management Board was established, with the Irrwanyere Aboriginal Corporation as the management authority for the Park. In 2012 the Arabana Parks Advisory Committee was established, with the Arabana Aboriginal Corporation as an advisory body for park management, but likely to become a co-management board for Wabma Kadarbu and Kati Thanda-Lake Eyre parks at some stage in the future.

Interest in the springs amongst researchers, both in South Australia and interstate, remained high at this time, and in 1997 I was one of the organisers of an informal gathering of researchers from a variety of institutions who met in Adelaide to provide reports and updates on their springs work.

The gathering was deemed to be of real value and was repeated multiple times over the next decade or so (Niejalke, 1998; Department for Environment, Heritage & Aboriginal Affairs, 2000; Halliday, 2001; Environment Australia, 2002; Gotch et al., 2006). The SA Environment Department facilitated most of the events, which we had initially dubbed Mound Springs Researchers Forum(s), although the topics and the attendees covered a range of Great Artesian Basin issues and interests. The seventh, and last, was held in Adelaide in March 2013, as part of the Great Artesian Basin Researchers Forum.

Community Involvement

After thirty years in the SA Environment Department and its various incarnations over that time, I retired in 2003. A close colleague in all things mound springs, Simon Lewis, retired three years later, and in 2006 we set about establishing a community group, Friends of Mound Springs (FOMS), one of many volunteer conservation groups in South Australia operating under the umbrella of a parent organisation, Friends of Parks Inc. A sister group, Friends of Simpson Desert Parks (FOS), had been established some years before and was providing voluntary assistance at Dalhousie Springs, and with this in mind FOMS made an early decision to focus its efforts on the springs between Marree and Oodnadatta, leaving FOS to continue its work with Dalhousie. FOMS has been an active group with a good blend of capabilities amongst its membership, and has picked up awards for both biological and heritage conservation work at the springs (<https://www.friendsofmoundsprings.org.au/>). At the same time – like many community groups – it has an ageing membership profile, and succession to a younger age cohort remains a challenge.

Coinciding with this has been a steady withdrawal of State Government involvement from mound springs conservation. Subject to ongoing budgetary constraints over many years, the State Environment Department has suffered major budget cuts in recent years. For the mound springs country, remote and expensive to access, this translates to a struggle to fulfil even basic statutory commitments to manage the two springs parks. Additionally, the Department has withdrawn almost entirely from maintenance and monitoring of the fenced exclosures protecting springs on pastoral lease country,

leaving the void to be filled by FOMS in a voluntary capacity. This is clearly not sustainable: the continuity of voluntary organisations into the future can never be guaranteed, and the maintenance of remote areas fencing from Adelaide, or even Port Augusta, makes no sense. When the exclosures were constructed over thirty years ago, it was envisaged that arrangements would be negotiated with the respective pastoral lessees for routine maintenance. For a variety of reasons this has not happened, and one of the failures of our approach to off-park conservation of springs has been an inability to actively engage and involve the lessees in the program.

Some Concluding Thoughts

Lest all this seem a rather gloomy note to conclude on, I need to say that we know very much more about mound springs now than when I first became interested in them, all those years ago. Local aquifer pressures have been helped by GABSI (and earlier South Australian Government bore rehabilitation work), a lot of very good biological, hydrogeological and cultural heritage work has been carried out over the decades, important parks have been established to conserve spring values, and livestock exclosures have been established and monitored for over three decades.

It has been my privilege to be involved in much of this work. However, under current governance and funding arrangements, I believe that within both State Government and the non-government organisations we have extended ourselves as far as we can. We will need to be innovative if we are to consolidate the gains of the past and do things better into the future. For this we will need new paradigms and models for good outcomes. Amongst other things, we will certainly need to involve regional stakeholders far more than has been the case hitherto, the pastoral lessees especially, as it is on their stations that most of the unprotected springs occur. And we will certainly need to use the knowledge and connections to the land of its traditional owners more effectively. The legal niceties of Native Title aside, Indigenous people hold moral title to the land, and it is incumbent that we all work together to conserve these remarkable features of our inland landscape.

Acknowledgements

I am grateful to the editors of this Special Issue for the work they have put into this paper; to two of my colleagues, Simon Lewis and Dr Jackie Venning, for reviewing an early draft of the paper; and for helpful comments from two anonymous referees.

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Author Profile

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