



AUSTRALIA NEW GUINEA FISHES ASSOCIATION

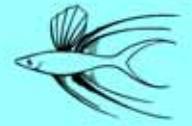
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Save Ewens Ponds!

by Gerard Carmody

On the weekend of 1-2 April 2006, members from the Australian New Guinea Fishes Association (ANGFA) travelled to Port MacDonnell to visit the magnificent wetlands of the south-eastern corner of South Australia. We came specifically to dive the uniquely spectacular and complex groundwater dependent ecosystem of Ewens Ponds Conservation Park (EPCP). Like the many thousands of visitors before us, the plan was to take in the experience of the crystal clear water and abundant aquatic fauna and flora. Unfortunately this trip was very different to past experience and expectations as we saw the alarming deterioration of the Ewens Ponds wetland and out-flowing Eight Mile Creek. The most noticeable change was the widespread infestation and impact of an aggressive new form of blue-green algae throughout the ponds and creek. Of major concern is the degradation of critical habitat for the vulnerable Ewens Pygmy Perch (*Nannoperca variegata*).

On our return from Ewens Ponds I was motivated to raise awareness of its rapid decline, including the impact on aquatic fauna and flora. As a part of this, I undertook research to become better informed about the issue and to alert and encourage all responsible authorities and interested parties to take immediate action.



Above: "Welcome to Ewens Ponds" – Department of Environment and Heritage signage – Photograph: Kath Moores



Above: The Ewens Ponds Creek channel linking Pond 2 to Pond 3 – Left: October 2002 – Right January 2006 – Photographs: Neville Skinner

Is History Repeating Itself?

In the late 1970s to early 1980s a dieback phenomenon was reported in Ewens Ponds. This eventually led to its closure to divers (Lewis, Stace 1980). By the late 1980s, however Ewens had mostly recovered (although some dieback continued for a number of years in the area of the fall-out zone from the water flowing from the cave in pond 3, Lipson 1989). The cause of this dieback remained a puzzle then as it does now. Are we seeing the return of this problem in 2006 or something different?

The first indication of the recent blue-green algae infestation in Ewens Ponds was reported by a local Dive shop in the summer of 2004/05. Perhaps not surprisingly, the mass outbreak of blue-algae occurred in the following summer of 2005/06 after another year of drought.

The Change

In previous regular visits to Ewens Ponds, aquatic vegetation such as water ribbon (*Triglochin procerum*) was commonly present at depths ranging from 1 to 6 metres (Hallam 1985). Beyond this depth, filamentous green algae and other benign blue-green algae species were present. This new infestation of blue-green algae is out-competing the most vigorous of these aquatic plants at depth as shallow as two metres leading to extensive die-back of aquatic plants throughout the system. Only in sections of the Eight Mile Creek, where water flow is significant does aquatic plant growth of species such as watercress (*Rorippa nasturtium aquaticum*), shield pennywort (*Hydrocotyle verticillata*) and river buttercup (*Ranunculus amphitrichus*) appear normal. Eight Mile Creek, however is far from free of this new infestation.

The luxuriant thick mats of filamentous green algae that covered the sloping banks of the three ponds from 5M depth have entirely disappeared and replaced with the ubiquitous blue-green algae. The visual “sand boils” feeding water into the bottom of the ponds 1 and 2 from the shallow-water aquifers have also significantly declined. These changes coincide with a drastic reduction in the previously plentiful populations of Southern Pygmy Perch (*Nannoperca australis*) which would normally be seen



Above: Southern Pygmy Perch (*Nannoperca australis*) schooling at the bottom of Ewens Ponds prior to the blue-green algae bloom.
Photograph: Rudie Kuitert



Above: The vulnerable Ewens Pygmy Perch (*Nannoperca variegata*).
Photograph: Rudie Kuitert



Above: Ewens Ponds – Left: Pond 2 October 2002 – Right: Pond 2 January 2006 – Photographs: Neville Skinner

congregating in large numbers near these “sand boils”. Common Jollytail (*Galaxias maculatus*), Congolli (*Pseudaphritis urvilli*), freshwater crayfish (*Euastacus bispinosus*), shrimp (*Paratya*) and numerous other species have also declined. The exceptions are River Blackfish (*Gadopsis marmoratus*) and Black Bream (*Acanthopagrus butcheri*).

Of most concern is the degradation of critical habitat for Ewens Pygmy Perch (*Nannoperca variegata*), of which only a few were observed in the creek sections and a small population congregating under the platform in pond 3. Ewens or Variegated Pygmy Perch are listed as vulnerable by the International Union for the Conservation of Nature (IUCN). Ewens Ponds, Eight Mile Creek, connecting Spencer’s Pond and adjacent Stratman’s Pond are critical habitats for this species (Hammer, Doube and Roberts 2000). The loss of Ewens Pygmy Perch from these locations would surely place them on the endangered red list.

In July 2006 a further visit was made with Neville Skinner from the Marine Life Society of South Australia (MLSSA) and our observations are that the blue-green algae have spread further within the three major ponds. The extent of the problem is clearly evident from the entry platform to pond 1 with rafts of blue-green algae floating on the surface. It is clearly plain to the observer that major changes have occurred which are having a very significant impact on both animal and aquatic plant life. It is essential that the impact be quantified in terms of important measures such as species richness, evenness and individual species number by a follow-up survey of similar detail to the research by Hammer, Doube and Roberts (2000).

Water: Precious Resource or Free Gift?

What makes Ewens Ponds such a wonderfully rich and unique aquatic ecosystem are the same things that result in the adjacent farmland being extremely attractive for intensive agricultural use and ultimately compete with the ecosystem for these resources (Hallam 1985, Skewes 2006). The plentiful clear and constant water flow from the unconfined Mount Gambier aquifer and rich seam of peat soils provide an excellent nutrient source for aquatic plants,

allowing for exceptional plant growth in the ponds and creek. So productive is this aquatic ecosystem that certain species of plants are able to flower underwater and oxygen is regularly observed fizzing from the tips of submerged photosynthesising plants. The long history of flooding and interconnection with other wetlands in the area, and Eight Mile Creek linkage with the ocean has resulted in a diverse and rich aquatic fauna and flora (Hammer 2002).

Yet despite the very special significance of this spring fed ecosystem, very little is known about the dominant hydrogeology, whether it is fed from a deep or shallow aquifer or the direction from which the water is flowing. Mostly, the current information is anecdotal and from recreational SCUBA divers. Being part of the greater Mt Gambier unconfined aquifer also makes these groundwater dependent ecosystems extremely vulnerable to pollution from agricultural run-off and waste disposal in sinkholes (Hammer et al 2000). The threat posed by agricultural run-off is very real as the soil depth is relatively shallow near EPCP.

The majority of the farmland surrounding EPCP is utilised for intensive dairy production which relies on an extensive



Above: Centre Pivot Irrigators at work – Port MacDonnell
Photograph: Gerard Carmody



Above: The Ewens Ponds Creek channel linking Pond 2 to Pond 3 – Left: October 2002 – Right January 2006 – Photographs: Neville Skinner



*Above: Ewens Ponds, Pond 1 pre blue-green algae bloom
Photograph: Rudie Kuitert*

*Below: Mats of blue-green algae near jetty of Pond 1 July 2006.
Photograph: Gerard Carmody*

artificial drainage network (post WW2 soldier settlement) to reduce water logging. In the past decade, the intensive use of Centre Pivot Irrigation to exploit the shallow groundwater aquifer resources and heavy fertilisation have made this area the most modern and productive dairy country in Australia. The groundwater resources have been utilised to maximise farm production all year round, effectively drought-proofing them. Coinciding with this increase in shallow aquifer extraction, the South East has experienced successive years of drought and the rate of water recharge back into the aquifer has fallen far below the amount extracted for agriculture (ref SENRM). The greater Mt Gambier unconfined aquifer has significantly fallen in level and as a result the hydraulic pressure pushing water through the aquifer is also believed to have declined. Only since June 2006 has it become mandatory for all farm bores to be metered. Up until then, the volume of water extraction was effectively uncapped. Recent measurements of water flow at the mouth of Eight Mile Creek are 30% below levels found in the 1970s (ref DEH), however it is unknown whether flow has reduced from the three ponds or from Eight Mile Creek. In addition to groundwater extraction, water is now drawn directly from the Ewens Ponds system (Eight Mile Creek) for irrigation and partly returned via a complex network of drains from the adjacent farmland. Since 1978, a trout farm has been given license to draw water from pond 2 and discharge below pond 3 into Eight Mile Creek. As a first and welcome step, an investigation will be carried out in late 2006 by a joint working group, lead by the Department of Environment and Heritage to measure water flow from pond 3 and determine the origin of the change. The outcome of this study will help shape the future direction of further investigations into this problem.



The Algal Bloom

Although the aquatic chemical processes involved in blue-green algae blooms are complex, they are known to be caused by reduced water flow and water stratification in eutrophic (nutrient rich) systems, such as the Murray River and Gippsland Lakes experience (Stevens 2006). Blue-green algae are able to fix their own nitrogen in freshwater, therefore nitrogen is not considered a limiting nutrient in Ewens Ponds. Small increases in nutrients such as phosphorus are known to trigger outbreaks in freshwater (Stevens 2006). In times of normally high water flow and limited nutrient input, Ewens Ponds effectively behaves as an oligotrophic (nutrient poor) system. The present blue-green algae outbreak points toward a significant change in water

flow or nutrient input (via farm fertilisation and run-off) and a thorough investigation of water flow and program of water analysis against a similar control system is urgently needed.

Potential sources of nutrient input into Ewens Ponds can be found in the adjacent farmland. High strength liquid NPK and trace nutrient fertilisers are pumped through giant centre pivot irrigation systems by a process of "fertigation" (see appendix for chemical breakdown). Optimum pasture growth is achieved with highly targeted fertiliser application, intensive irrigation and well drained soils (Skewes 2006).

Soil Drainage and Dredging of Eight Mile Creek

Responsibility for the management of Eight Mile Creek is with the South East Water Conservation and Drainage Board (SEWCDB). The SEWCDB is comprised of the landholders adjacent to EPCP and a few government representatives. As irrigation has increased close to EPCP, drainage of water logged soils has become more critical to optimise pasture growth. This is a challenging task as it was once part of a major wetland system. Dredging Eight Mile Creek is viewed by SEWCDB as a viable way to enhance soil drainage of the adjacent farmland. Dredging in theory supposedly reduces the resistance to water flow in the creek which then lowers the water levels in the three ponds and surrounding water table. Increasing irrigation and fertigation adjacent to EPCP, however, may lead to an



*Above: "The dredge" chained to tractors either side of Eight Mile Creek and dragged along, taking flora and fauna with it.
Below: Permanently damaged creek bed.
Photographs: Gerard Carmody*



increase in nutrient load to Ewens Ponds via run-off through the shallow soil into aquifers or overground. If this were to occur, it may also lead to a cycle of increased aquatic plant growth in Eight Mile Creek and in turn greater call for dredging.

The SEWCDB's continued desire to dredge aquatic plants from Eight Mile Creek and claims that Ewens Ponds would benefit, need to be seriously questioned. It is difficult to see how dredging and dropping the water level further would improve water flow through Ewens Ponds given the hydraulic pressure of the aquifers feeding the ponds has probably declined. When snorkelling Eight Mile Creek to the mouth during our recent visits, at no stage did we observe any creek blockages caused by aquatic plant build up. The creek was free flowing with at least a metre of clear water depth on average. Past dredging practices have caused great destruction to habitat and loss of aquatic life (Skinner, Hammer and Playford, 2004). Eight Mile Creek is especially important for recruitment of fish back into the ponds if and when they recover. Any further request for dredging should be scientifically evaluated before going ahead as it is clearly opposite to the interests of the sustainability of EPCP.

Recommendations

Urgent and well coordinated intervention is needed to save Ewens Ponds. Specifically, the Federal Department of Environment and Heritage (DEH) and South Australian Department of Environment and Heritage (DEAH) must carry out their responsibilities as custodians, according to the EPCP Management Plan (1999) and ensure that all actions are taken to determine and implement remedial solutions. This needs to be an absolute priority for DEH and DEAH. The South East Natural Resource Management Board (SENRM) must take into consideration when developing the Natural Resources Management Plan, the requirements of groundwater dependent ecosystems such as EPCP in groundwater allocation.

Despite some very basic and non-specific chemical and water flow monitoring at the mouth of eight Mile Creek, the breadth and extent of this analysis and knowledge of the aquifers feeding the Ewens Ponds system remains inadequate (see appendix for representative analysis). This must be rectified. The South Australian Environment Protection Agency and other relevant working groups must be given a key project management role to comprehensively analyse and understand this ecosystem, including the key hydrological and chemical processes. There must also be specific and ongoing funding and political will to do this. Current resources allocated to this problem are grossly insufficient. These agencies of talented scientists and professionals are capable if given the commitment of time and resources, to develop and implement an appropriate plan.

The water resources of south eastern Australia are a finite and precious resource. More precise and selective irrigation practices need to be implemented and farms operated within a water budget. If agrochemical run-off is also found to be a key contributor to Ewens Ponds decline, then a cap on fertiliser usage, similar to current European farm legislation, must be adopted. Farms need to work within tighter water and fertiliser budgets.

Unfortunately, the Ewens Ponds Conservation Park excludes the important downstream section of Eight Mile Creek, which has long been under the control and management of the SEWCDB. The Ewens Ponds ecosystem and connecting Eight Mile Creek are of exceptional ecological significance. Continued reference of Eight Mile Creek as a “drain” is archaic and completely unacceptable. Steps need to be taken in bringing Eight Mile Creek back into the Ewens Pond Conservation Park and move to National Park status.

The creation of greater buffer or riparian zones adjacent to EPCP is needed. The current boundaries allow cattle to walk within meters of the ponds, increasing the likelihood of agricultural run-off. The DEAH must also give consideration to acquisition of available land for buffer zone and inclusion of Eight Mile Creek as part of the Ewens Ponds Conservation Park as outlined in the 1999 Ewens Ponds Conservation Management Plan.

A Call to Action

I urge everyone who is interested in the preservation of Ewens Ponds to write, phone or e-mail the following government representatives to express your concern. Ewens Ponds will not survive if we remain indifferent. Immediate action is needed and the highest priority given to this groundwater dependent ecosystem, especially in the allocation of groundwater (i.e. the SENRMB Water Allocation Plan).

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Email: senator.ian.campbell@aph.gov.au

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- Personal Communications: EPA VIC – A Stevens, MLSSA – N Skinner, NFA – M Hammer, R Kuiter. K Smales (layout and type-setting).
- Skewes, M., Treloar, N, Bailey, G. 2006. “*Irrigation Innovations in the South East of South Australia*”.

*Below: Ewens Ponds March 2006 (Pond 3) – Common Jollytail (Galaxias maculatus) swimming amongst the blue-green algae afflicted ribbongrass (Vallisneria americana).
By July 2006 the same aquatic vegetation had been killed off.
Photograph: Gerard Carmody*



Appendix:

Chemical Analysis

The following chemical analysis is courtesy of DEH, Hammer, Doube and Roberts (2000) and Monash University Water Studies Centre.

Along Eight Mile Creek one can find empty and full one-tonne boxes of "fertigation" fertiliser by the side of the road.

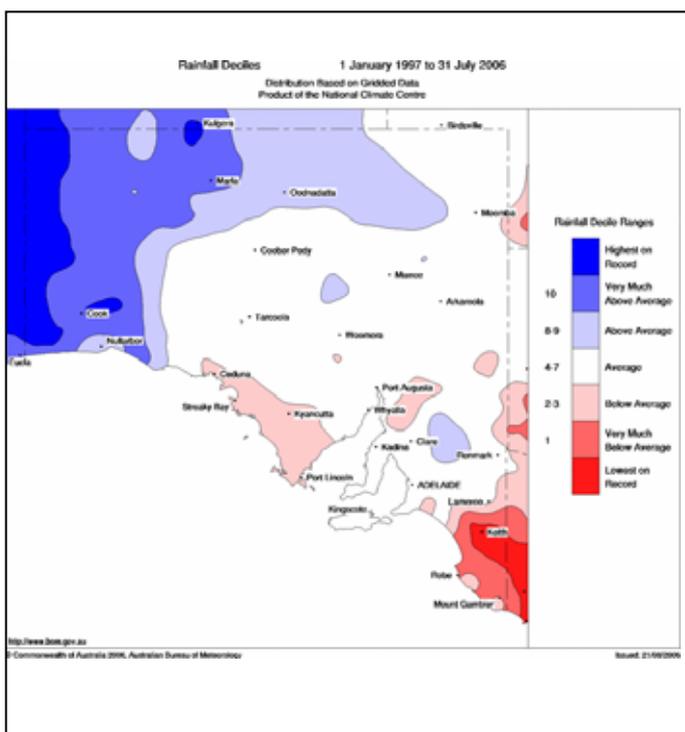
These are stored in the open paddock and used in the Centre Pivot Irrigation process. The particular product used by one farm is manufactured by the South Australian company Spraygro Liquid Fertilisers.

The product used is called BASE™ 15 - 18 - 20 +, a Nitrogen, Phosphorus, Potassium and trace metal, high strength fertiliser (information freely available from the product data sheet and msds listed on the Spraygro Website). This product is a typical fertigation product and contains very high concentration of algal growth limiting nutrients, in particular phosphorus in the readily accessible polyphosphate form.

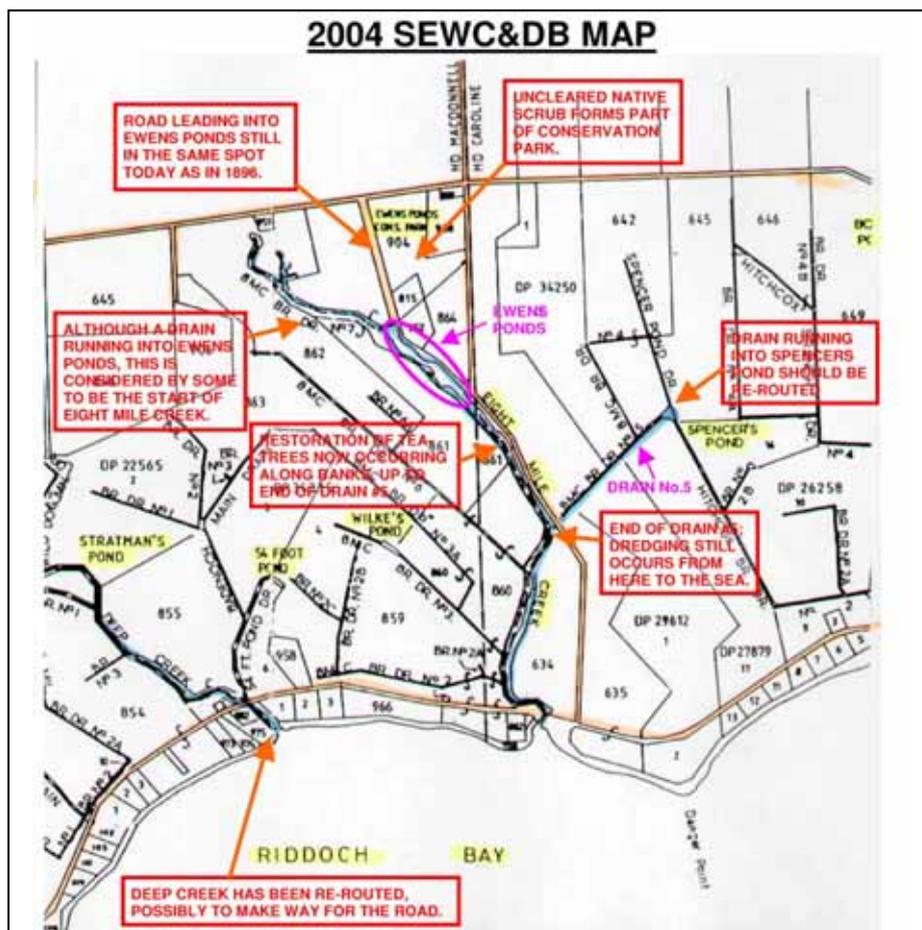
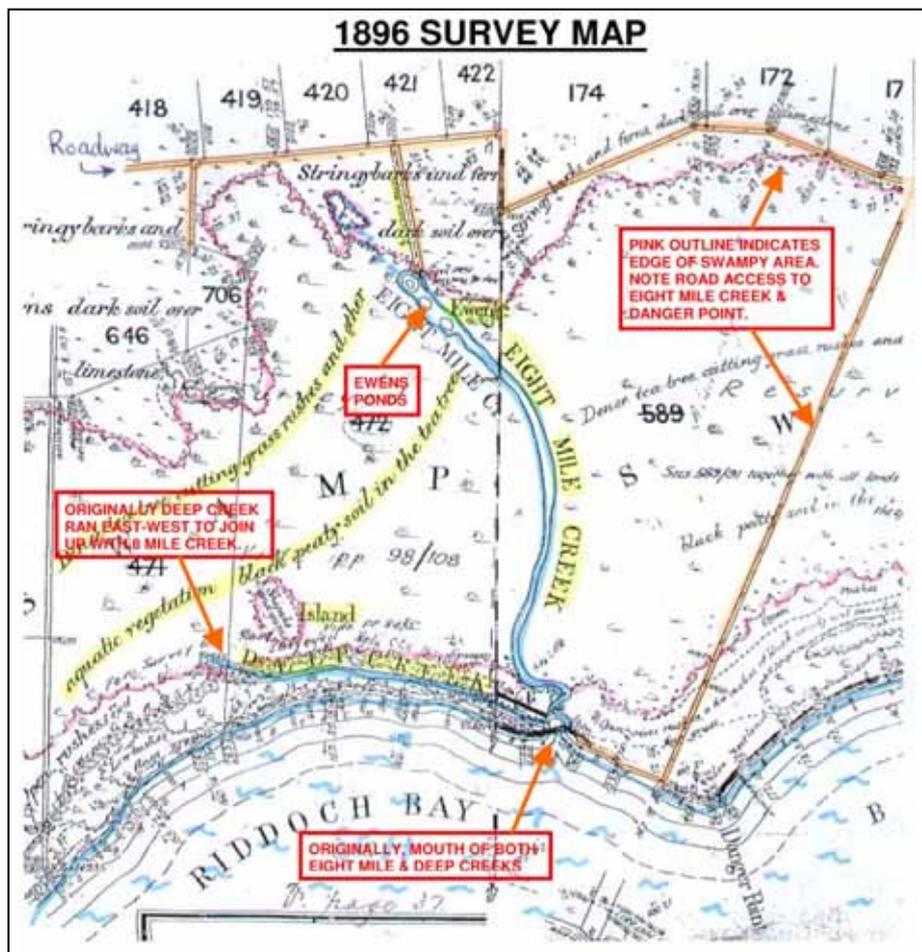
Based on Eight Mile Creek flow rate of 2300 L/second (Lewis 1980), a measurement of 0.01mg/L Total phosphorus (analysis by Monash University Water Studies Centre - April 2006) correlates to 2Kg per day of total phosphorus reaching the mouth of eight Mile Creek. This is an approximate calculation and does not take into account 2006 reduced flow rate or phosphorus uptake by aquatic plants along the journey. Therefore a one tonne box of BASE™ 15 - 18 - 20 + fertiliser (15%w/v Nitrogen, 18% Phosphorus, 20% Potassium, 0.4% S, 0.02% Mg, 0.1% Fe, 0.08% Mn, 0.1% Zn, 0.03% B, 0.04% Cu, 0.0017% Mo) is equivalent to 90 days phosphorus loading to Ewens Ponds. Therefore if even a small fraction of the fertiliser applied in the Ewens Ponds catchment made its way into the shallow aquifer or drainage channels feeding Ewens Ponds, then it is plausible that this may be contributing significantly to the blue-green algae problem.

Period	Location	Nitrogen mg/L	Phosphorus mg/L
Late 1970s through to early 1980s (DEH)	Ewens Ponds system, Eight Mile Creek mouth	NOX 3.8-5.0 average 4.72 TKN 0.17 (organic + NH4+)	Nottested
1994-95 (DEH)	Ewens Ponds system, Eight Mile Creek mouth	NOX 4.9-5.2 TKN 0.3-0.1	0.008-0.02
2000 (Hammer et al, 2000)	Ewens Pond	NOX 5.46 TKN 0.30	< 0.005
April 2006 (MUWSC)	Ewens Ponds system, Eight Mile Creek above Spencers drain # 5	Total 5.80	Total 0.01
April 2006 (MUWSC)	Piccaninnie Ponds jetty	Total 2.70	Total < 0.01

Changing Rainfall: The ten year history of rainfall in South Australia. The Mount Gambier region (encompassing Ewens Ponds) has received below average rainfall. The rainfall of the catchment just to the north is very much below average during this past decade. Courtesy of Australian Bureau of Meteorology



Above: Map of Sinkholes of the South East & Ewens Ponds, (Lewis & Stace 1980)



The 1896 map shows how many drains were created to drain the former wetlands. Note the number of ponds (springs) that exist today (and still others exist either side of this map). Unfortunately, Ewens Ponds and Eight Mile Creek sit in the centre of this area and suffer as a consequence. When the maps are overlayed it shows just how accurate the old maps really were