





FLOODS

Rainfall-dependent boom and bust cycles are almost part of Australian arid-zone folklore.

FROGS

In this article, CALM ecologist Andy Chapman describes some memorable events during the

FLOWERS

wettest year on record for much of the Western Australian Goldfields.

It was a most unusual year of

and FIRES

floods, frogs, flowers and fires.

BY ANDY CHAPMAN

The year 1992 in the Goldfields began like most others: it was hot, dry and exhausting. Many of the people from towns such as Kalgoorlie-Boulder were enjoying their traditional coastal holiday, for example at Esperance on the south coast. Just two days before the New Year, something had happened which at the time seemed to be an isolated occurrence, but was in fact a sign of what was to come.

FLOOD

On 30 December 1991, at Credo Station homestead about 70 kilometres north-west of Kalgoorlie, 110 millimetres of rain were recorded in just four hours. Apart from some temporary inconvenience at the station, the effect of this rain was to fill the

nearby Rowles Lagoon—a small but ecologically significant semi-permanent freshwater lake. The almost instant filling of the lake was all the more remarkable for the fact that it had been completely dry for the preceding 18 months; there had been drought in the Goldfields. On returning from holiday, many Goldfielders drove to Rowles Lagoon to

witness the unusual spectacle of a flooded freshwater lake in a region where evaporation exceeds rainfall by at least 10 times.

It was not until March 1992 that there was the first indication the Goldfields region was in for 'a big wet'. In that month alone, 105 millimetres of rain were recorded at Kalgoorlie-Boulder, as opposed to the monthly average of 19 millimetres. Many centres in a large area between Cue, Sandstone, Leonora and Balladonia recorded similarly large rainfalls. The immediate effect of these rains was to close roads, fill large salt lakes and disrupt pastoral and mining activities. Scientific field trips planned by the Department of Conservation and Land Management (CALM) were cancelled, or staff returned home with their trips unfinished when access was cut off.

FROGS

In April, the first of many biological responses became apparent. One warm evening, volunteer Andrew Coen and I travelled to Victoria Rock, a large and spectacular granite rock 45 kilometres south of Coolgardie, to see what effect the rains had had on frogs. The fauna of the rock and its surrounds are fairly well known from work done by CALM and the Goldfields Naturalists' Club. We had previously recorded only one species of frog, the ubiquitous western toadlet (*Pseudophryne occidentalis*), but it seemed likely there would be others, because even an arid area like the Goldfields hosts at least 10 species. However, we were not prepared for what we found.

The surface of the rock was teeming



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Aerial view of the flooded Rowles Lagoon taken in July 1992. The lagoon is still flooded today.
Photo – Andy Chapman

Above left: Rowles Lagoon (September 1988) showing water levels before the long dry period.
Photo – Jiri Lochman

Left: In April 1992, the kunapalari frog was found in great numbers in the pools surrounding Victoria Rock.
Photo – Jiri Lochman

with thousands of frogs. In some places, it was hard to avoid treading on them. The males were all calling to attract mates in a cacophony of competing and desperate calls. The contrast between then and previous evenings, when I had searched in silence and in vain, provides an unforgettable memory. The visual image is reinforced whenever I replay the tape recording made at the time. The frogs on the rock were humming frogs (*Neobatrachus pelobatoides*). In pools surrounding the rock, calling with a characteristic penetrating trill were kunapalari frogs (*Neobatrachus kunapalari*).

Also in April–May, large numbers of waterfowl began congregating on vast Goldfields salt lakes, small freshwater lakes, swamps and station dams. One of the most persistent enquiries described a ‘bantam-sized small, dark chook’ that turned out to be the black-tailed native-hen (*Gallinula ventralis*). They were present in small flocks, numbering up to about 50, wherever there was water. In all, 36 species of waterfowl used these inland wetlands, of which 17 species bred here. Breeding must have begun shortly after the waterfowl arrived. Early breeding species such as black swans were nesting in May, and grey teal had dependent young that same month. Breeding continued throughout winter, in spite of low inland temperatures, but most records were made in November. Breeding in summer on three freshwater lakes were freckled ducks, Australia’s rarest waterfowl.

The most memorable day of the ‘year of the big wet’ was undoubtedly the day that CALM Regional Manager



Top: Rowles Lagoon was dry for 18 months before the heavy rains of December 1991.
Photo – Andy Chapman

Centre: The first of many boat expeditions on Rowles Lagoon during winter 1992.
Photo – Andy Chapman

Right: A red-kneed dotterell’s nest found at Arrow Lake in July 1992.
Photo – Andy Chapman



Above: Wildflowers along the Leonora-Laveton Road provide a brilliant array of colour and texture.

Photo – Andy Chapman

Left: The lilac-coloured tall mulla mullas were abundant in mulga woodland.

Photo – Jiri Lochman

Below: Lake Raeside, an ancient drainage system, stretches 250 km when full.

Photo – Andy Chapman

Ian Kealley and I, with volunteers Chris Daws and Trevor Don, put a dinghy on Rowles Lagoon to assess numbers and species of waterfowl. The trip turned into a 40-kilometre odyssey in which we crossed some 2 500 hectares of flooded woodland and thicket, navigating by satellite and map to return to our starting point. At one point, we were forced to leave the water and carry the dinghy and outboard motor for half a kilometre over a ridge to resume our journey.

We hired an aircraft to assess those wetlands we couldn't reach by land. The oblique aerial view of Lake Barlee and its islands stretching to the horizon like a

vast inland sea was unforgettable. Lake Raeside too presented an interesting phenomenon. At 250 kilometres in length, it is reputed to be Australia's longest inland lake. This is because the 'lake' is a palaeodrainage, effectively a 'fossil' river from a time some 65 million years ago when, with a wetter climate, extensive rivers with rainforest along their banks crossed the inland areas.

In 1992, and before that in 1975, Lake Raeside again functioned as a river, maintaining downstream flow and nutrient transfer. The biological significance of these events is unknown, but circumstantial evidence suggests the

drying–flooding cycle and downstream nutrient transfer initiate the waterfowl breeding cycle on these lakes.

For waterfowl, one of the most biologically significant aspects of these lakes is the enormous fluctuation in salinity. For example, the salt content of Black Flag Lake (20 kilometres north of Kalgoorlie), which was measured in December 1992 as one seventh that of seawater, had multiplied 28 times when measured about one year later, two weeks before the lake dried out completely. Most waterfowl move off wetlands before the salt reaches this level, though some, such as grey teal and mountain duck, remain.





Above: Spring 1992 brought a splash of colour along Evanston Road.
Photo – Andy Chapman

Right: A 'snow-covered' landscape of splendored everlastings.
Photo – Andy Chapman

Below right: Large numbers of waterfowl, such as the black-tailed native hen, began congregating on Goldfields wetlands in autumn 1992.
Photo – M & I Morcombe



FLOWERS

The winter solstice passed, the rainfall continued to be well above average and, with the gradually increasing temperature, plant growth responded dramatically. Goldfielders generally consider that their spring begins in August. In 1992, as early as late July, there were signs that it was to be no ordinary year for plant growth. In a normal year, the eucalypt woodlands of the southern Goldfields are characterised by their extremely open ground cover layer. In fact, when viewed from the air, the red-brown hue of the soil is the dominant feature. In July and August 1992, the red-brown had been replaced by a green hue due to the prolific growth of spear-grasses. As the season progressed, the green changed to yellow as the grasses increased in density and cured. Thus, the normally discontinuous fuel of the woodlands, mainly comprised of litter under widely spaced trees, was now continuous; a potentially flammable carpet of grasses.

In the northern Goldfields, which are occupied by mulga woodlands, the response was different; here annual plants, particularly daisies and composites, provided the dominant ground cover. Unlike the grasses in the south, they provided a brilliant array of both colour and texture.

At one place, 26 kilometres east of Leonora on the road to Laverton, the white-flowering annual splendid everlasting (*Helipterum splendidum*) created the impression of a snow-covered



landscape. In mulga woodland, on Diemals Station and elsewhere, lilacs of tall mulla mulla (*Ptilotus exaltatus*), blues of blue pincushions (*Brunonia australis*), and orange-yellows of orange immortal (*Waitzia acuminata*) were displayed in a spectacular array. The familiar and comforting red-brown of the soil was lost in this brilliant and continuous kaleidoscope of colour and texture. Further north, on Wanjarri Nature Reserve, the bare red-brown soils had disappeared under knee-high *Helipterum crasspedioides* and *Haloragis foliosa*. Claypans filled with water, and

waterfowl such as black-fronted plover, were recorded for the first time since recording began 50 years earlier. Nearby Lake Miranda was host to 11 species of waterfowl, of which five were breeding. The lake also provided a very rare opportunity to demonstrate to students of Leinster Primary School some aspects of inland lake ecology, as well as the unlikely chance to do some canoeing.

FIRES

Staff at CALM's Kalgoorlie office had spent much of spring 1992 discussing and planning for a predicted increase in



This wildfire on Diemals station was out of several that occurred in summer 1994.

Photo – Ian Kealley

wildfire risk during summer. In a normal year, the risk is not considered great because of sparse and discontinuous fuels, and wildfires, which are usually ignited by lightning, are generally left to go out. However, this year was clearly different. Some Goldfielders remember the summers of 1974–75 and 1975–76 when, following similar rains to those of 1992, large wildfires burnt 30 million hectares—nearly 12 per cent of the area of Western Australia. During those summers, 12 million hectares of pastoral lands were burnt. Mindful of these events, and with the added advantage of satellite technology to assess vegetation growth over large areas, *The West Australian* of 5 November 1992, under the headline 'The heat is on', predicted 'the worst bushfire season for 100 years'.

Apart from numerous small grassfires around Kalgoorlie, the first large wildfire in remote country started by lightning was on 12 January 1993. It burnt an area of approximately 2 000 hectares some 20 kilometres south of Burra Rock. This fire was successfully controlled four days later by containing it within a firebreak built by a bulldozer. Few other fires were so small or so successfully contained. Other large fires that season were in the vicinity of Caiguna and Balladonia on the Nullarbor Plain.

It was not until the following summer of 1993–94 that fully cured fuels and further growth presented an even greater threat. In October, a small fire burnt approximately 60 hectares of Kurrawang Nature Reserve; this fire was unusual in

that it spread from a burn-off at a rubbish tip. The following month some 120 000 hectares were burnt on Kanandah and Woolba Stations on the Nullarbor. The summer continued with increasingly larger fires of greater duration.

The Nullarbor was a problem area. Three fires that started on New Year's Eve 1993 had burnt out 200 000 hectares within three days. In spite of a massive control effort involving aircraft surveillance and ground crews, this fire re-ignited in mid-February and burnt another 10 000 hectares on Balladonia Station. This example shows the difficulty of complete and effective control of large fires in remote locations under high fire risk. Other large fires burnt west of Diemals Station and between Lake Johnston and Hyden. This latter fire burnt some 400 000 hectares and had a maximum dimension of 110 kilometres. Both fires later showed up as massive and dramatic red signatures on LANDSAT satellite imagery.

Much of the risk had abated by March 1994. By winter, however, in one of nature's contradictions, dry conditions had returned again, and by late August most parts of the region were experiencing their driest six months on record.

Thus, the wettest year on record came and passed. It provided many unforgettable images and events of both aesthetic and biological interest. From the point of view of conservation managers in an arid environment, it enabled valuable insights into the

functioning of arid ecosystems. For example, it is now much clearer to me how 10 species of frog manage to survive in the Goldfields.

In addition, on-going monitoring of the effects of the fires graphically indicates how regeneration occurs. At the fire site south of Burra Rock, for example, gooseberry mallee (*Eucalyptus calycogona*) and *Eremophila caerulea*, which are both components of the perennial flora, are now present in vastly increased numbers, as well as numerous 'fire opportunists', whose temporary presence is only due to changed soil chemistry and reduced competition. Some of the effects of 'the big wet' did not become apparent until nearly two years later; a declining plant species, currant bush (*Scaevola spinescens*), is now frequently seen as a small germinant, 5–10 centimetres high. It may be part of nature's plan that alternating wet and dry cycles stimulate renewal for some species.

In spite of the great deal that can be learned from events like those described, the final insights are more philosophical than scientific. It is humbling to be reminded of how little we really know or understand, and although planning and management are important aspects of conservation, unpredictable events are also part of what we have to manage for.

Andy Chapman is the regional ecologist at CALM's Goldfields Regional Office. He can be contacted on (090) 21 2677.

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LANDSCOPE

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The golden whistler is a common forest bird. 'Forest Focus' (on page 10) discusses a five-year study into the effects of timber harvesting on forest birds, insects and mammals.



The 10th Light Horse Memorial Trail is one of two walktrails in Neerabup National Park. The story on page 22 takes you inside this little-known park in Perth's northern suburbs.



In the closing days of 1991, heavy downpours of rain flooded Rowles Lagoon in WA's Goldfields; and so began an unusual year of floods, frogs, flowers and fires (see page 42).



Aboriginal people of the northern deserts call the black-headed python 'warrurungkalpa', which roughly translates as 'grinder or crusher of rock wallabies'. See the story on page 17.



Radio collars are fitted to feral cats to help scientists track their movements. 'Hunting the Hunter', on page 36, focuses on research into the habits of these supreme desert hunters.

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The majestic and graceful whale shark visits the north-west of Western Australia each year and is fast becoming a major tourist attraction. What does the future hold for the world's largest fish? See page 28.



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