

# Trees and Water -a parable of the Avon River

By Roger Underwood



## Introduction

“Trees and Water” – what a boring and prosaic title for a talk!

Perhaps if I had added “Fire” it might have sounded more interesting. I could have referred to that quartet of Earth, Air, Water and Fire – which the philosophers of ancient times regarded as the four basic elements, from which everything else derived. I love discussing fire, but this will have to wait for another occasion.

The context of my talk might also sound boring and prosaic. It is the Western Australian central wheatbelt, and not just this unglamorous landscape (to which no tourist aspires), but to its role as a water catchment for that little-known, or at least little-understood river, the Avon.

The Avon River is a remarkable waterway. I love it not just because it is unconventional, but because it highlights the relationships between the natural environment and human society, and the way these relationships can sometimes lead to unhappy, and sometimes to happy consequences.

## Background

First some personal history. We spent most of our married life living in the karri forest. Ellen grew up on a dairy farm at Manjimup and was a teacher at Pemberton. I worked for many years as a forestry officer at Pemberton, Northcliffe and Manjimup. I loved the karri forest, and I loved looking after it. But it has its disadvantages as a place to work and live.



*Karri forest just east of Pemberton*

To live and work in the karri forest you need to be able to tolerate several things.

There are the long, damp winters, and cold drizzly days. You can't walk through it, at least not with comfort, as the wattle scrub is thick, prickly, impenetrable and usually soaking wet. The karri forest is a *visitor's forest*, a tourist's forest – something to enjoy from the car, the manicured picnic spot, the well-engineered walking trail or from your lounge room chair in Nedlands or Shenton Park. Nobody goes for a walk *in* the karri forest, other than forestry officers who have no choice in the matter.

But then in the 1980s I discovered that other Australia – the woodlands and savannas of the Goldfields and the Murchison and the glories of bushland reserves in the wheatbelt like Dryandra, Tutanning and Boyagin.

Here I relished an open, sunlit landscape, replete with some of the world's most beautiful trees, a land of clear skies, hot days, freezing nights, a garden through which you could walk and enjoy the blossom and aromas of the bush, the dry leaves crunching beneath your feet. This was bushland in which you could immerse yourself.

It was also a dryland environment. Summers lasted six months, and were often rainless except when punctured by the odd tumultuous thunderstorm. There was water in the landscape, but this was in the form of salt lakes, not the streams and rivers of the karri country.



*Wandoo forest at Dryandra*

So, after spending ten years in Perth, and hankering for the bush, in 1990 we bought a small property just south of York, on the western edge of the wheatbelt; we have lived there, off and on ever since, converting stubble paddocks into our own woodland of beautiful West Australian trees. The Avon River is our eastern boundary and our grandchildren's playground.



### **Discovering the Avon**

Little did I know at the time how interesting a river is the Avon, and the lessons it would teach me over the coming years.

Of course, I had vaguely heard of the Avon River before, and of its "One Day of the Year" (the Avon Descent boat race), but it was only when I found it flowing past my back fence, that I started to study

and explore it, and to become aware of the degree to which it is a unique riverway. I also started to think about that wonderful molecule, H<sub>2</sub>O and its role in shaping the landscape around me, and the ecology, biodiversity and history of the interactions between water, vegetation and human society.

I began to see that when it comes to the relationship between water and the environment, it is more than just “rain makes things grow”. The Avon River and its catchment are replete with perplexities and anomalies. Ironically, too much rain has had disastrous results, but too little rain has also had wonderful, unexpected outcomes, all of which I will talk about in a moment.

### The geography of the Avon River

Here is a map of the Avon River



Starting out near the wheatbelt’s Lake Yealering, it flows for a distance of about 150 km through the agricultural areas now known as the Avon Valley, before coming to an end at the junction with the Wooroloo Brook at the foot of the Darling Range and then morphing into the Swan River. On the map it looks like a pretty normal sort of river, apart from the fact that it basically runs north, not west or south as do all the other main rivers of southern WA. So why do I describe it as perplexing and anomalous?

Well in the first case, the Avon acts *in reverse* to that of the great rivers of the world. Think of the Ganges, or the Amazon, or even of the Murray River in south-eastern Australia. Traditionally, rivers start as rivulets in the high mountains or uplands. The rivulets join together and grow, and eventually the waterway becomes a broad river that flows into the sea. We all remember that little poem by Tennyson called *The Brook*, that people of my generation were taught to recite at primary school:

*I come from haunts of coot and hern,  
I make a sudden sally,  
And sparkle out among the fern,  
To bicker down a valley ...*

How well Tennyson captures the traditional waterway, allowing us to picture that little brook as it bickers down a valley and then joins forces with other bickerers before becoming a stream and then a river, finally reaching the ocean.

But the Avon is the reverse. It starts in the flat lowlands of the wheatbelt and ends in the uplands of the Darling Ranges. It never reaches the sea, as it becomes the main headwaters of the Swan River.



*Above: Typical landscape in the upper catchment of the Avon River*

*Below: The foot of the Avon, flowing through its gorge in the Darling Range*



There are no mountain ranges at the back of The Avon River's enormous catchment area. This catchment, incidentally, is 125,000 sq km in area (larger than Tasmania) and has not a single permanently-flowing tributary – just chains of salt lakes that occasionally or seasonally fill and overflow.

The Avon River is a “real river” by which I mean a broad stream flowing in a channel between banks, only from the foot of the Yenyening Lakes south-east of Beverley, until it reaches Walyunga and becomes a headwater of the Swan River.

**The Avon – as it was.**

Imagine for a moment that you are a member of Ensign Dale's party, the first Europeans to reach the Avon River in 1830, or one of the pioneer settlers in the Avon Valley who followed in Dale's wake. You would have welcomed and loved the Avon River, but found it puzzling, at least by European standards. The river water was turbid (or mildly muddy) but fresh, and it was fiercely seasonal ... the river ceased to flow every summer for up to 3 months of the year. There was no single river course along its length, but it was subdivided into a series of deep, shaded pools. These were linked by braided areas where the river broke into many streams that thread their way through clumps and islands of ti-tree, sheoak and flooded gum, into long billabongs or cascaded across rocky bars.



*Gwambygine Pool*

Back then, the river would have been alive with numerous species of birdlife, fish and crustaceans, and there would have been wildlife and grassy plains along both banks. You would also have encountered Aboriginal tribes, for whom the river was one of their most important resources and symbols.

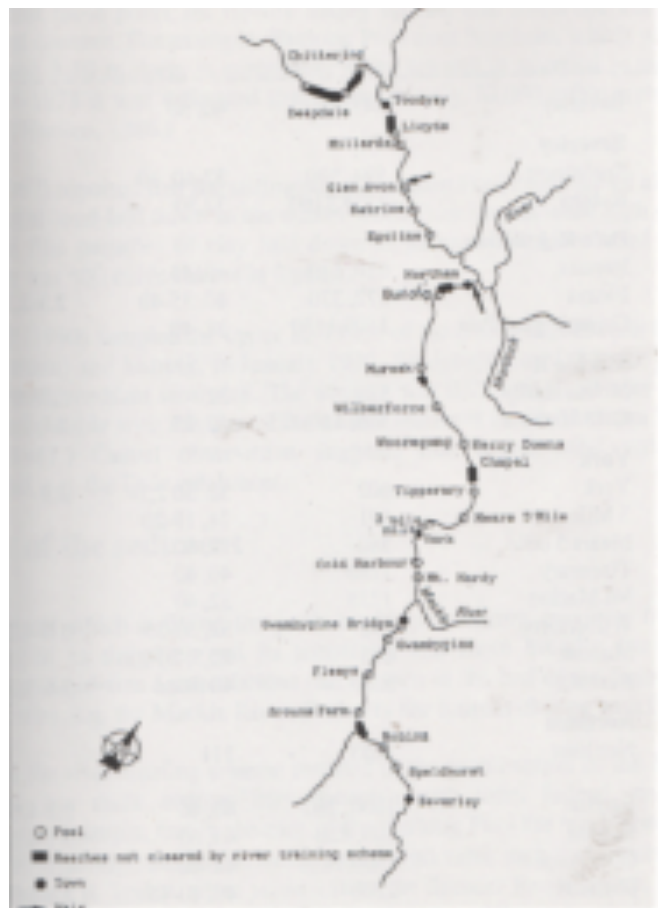
The river of those days was a sedate, slow-moving one (quietly flowing like The Don), but it also had occasional wild moods, when torrential rains would bring floods raging down the river, and then it would overflow onto the broad floodplains that lined its course.

Given the climate of this region, with its long, dry summer every year, it is not surprising that all of the pioneering properties in this region were situated by the river, as were all the main settlements: the first towns of our agricultural regions were Brookton, Beverley, York, Northam and Toodyay and all are river towns. The Avon River was first and foremost the primary source of water for all domestic, industrial and agricultural purposes in the pioneering days.



*A working horse team refreshing itself in the river at Wilberforce*

The finest feature of the 'old Avon', as I call it, was the river pools. There were 22 of them between Beverley and Toodyay, and because they lasted all through the summer, they were more like small freshwater lakes. In those days, the Avon Valley was WA's Lake District.





Of the Mt Hardy Pool, where for decades York people picnicked and swam and held swimming races and carnivals, it was said to be so deep that no diver had ever been able to reach the bottom. In the days before Shire Olympic pools and backyard pools, the Avon pools were the aquatic recreational areas of a whole region.

Of interest historically is that the high quality of the Avon River water, and its heavy volumes made it the first choice when CY O'Connor was designing the Goldfields Water Supply scheme in the 1890s. The original concept was for a dam on the Avon, probably near Northam, from which the water could be piped to Coolgardie and Kalgoorlie. There were two problems, however. Firstly, there was no suitable dam site – mostly the Avon flows through wide, flat valleys; and secondly, the dam would have flooded thousands of hectares of the best agricultural land in the Avon Valley (WA's principal producer of wheat for flour, oats for stock feed and barley for beer) and possibly the town of York. For these reasons, the decision was made to build the dam on the Helena River, where there was a magnificent site for what became Mundaring Weir, and also the area to be inundated was jarrah forest, about which nobody cared much in those days.

### **The wheel of history revolves.**

How things have changed from those halcyon days of the late 19<sup>th</sup> century.

Fast forward to 2023, and a few only of the 19<sup>th</sup> century characteristics of the Avon River survive. It is still true that the river flows "in reverse" as it were, from the open flatlands of its upper catchment to the rocky hills of the Darling Range. And it still ceases to flow every summer, drying up into pools and billabongs. And still, to the puzzlement of the uninformed observer, it recommences to flow in the autumn, as it always has, but always *before* the arrival of the first rains.

But today's Avon is very different from the Avon of yesteryear. There have been many tragic changes. An 1830s explorer or settler would hardly recognise it today.

Originally, the Avon River water was fresh, or at worst mildly brackish at the end of summer. Today, the Avon is a salt river and is ecologically almost sterile. Unlike the Nile, the Ganges, the Amazon or the Murray, its waters cannot be drunk, even by stock, except in certain circumstances, or used for irrigation. For today, for most of the year the Avon River is saltier than the ocean.

This is not a natural phenomenon, it is man-made ... an unintended consequence of the clearing of the catchment for agriculture. When deep-rooted woodlands were replaced by shallow-rooted crops and pasture, the salt-laden groundwater was able to rise to the surface, and find its way into the lakes, swamps and waterways. The modern environmental disaster of soil and waterway salination was the result.



Salinity was an outcome of ignorance, or at best mischance – we simply did not realise how bad things would get until it was too late ... and a terrible failure by successive governments to listen to warnings. The fact that bushland clearing would lead to salinity was known by 1910 (after a serious scare in the Helena Catchment that threatened the Goldfields Water Supply Scheme), and was published in 1924 (by railways engineers, worried about the effect of increasingly saline water on steam locomotives), but it was not until the 1990s that real concerns arose in government and agricultural circles.

[In retrospect, how fortunate it is that the Avon River was not chosen as the source of the Goldfields Water Supply – by the 1940s the river was salt and the whole water supply system to the Goldfields and wheatbelt would have collapsed].

#### **Worse was to come.**

The second great blow to the Avon River was no mischance, no unintended consequence - it was done deliberately, and by the government, supported by local communities. This was the great flood-mitigation program called “The River Training Scheme”

As I have mentioned, the Avon River has always periodically flooded. This was entirely natural. Typically, flooding occurred when summer thunderstorms or a cyclonic rain-bearing depressions

filled the lakes of the interior to the brim, and saturated the catchment, and this was followed by an above-average winter rainfall. When this combination of events happened, the whole system overflowed. The structure of the river actually made it more prone to flooding – floodwater would fill the pools and build up behind the braided sections, and then overflow the banks onto the adjacent floodway.



*Heavy winter rains on top of summer thunderstorms, result in a winter torrent at Gwambygine*

However, the river was naturally able to cope with this, as it had broad floodplains on both banks; these were covered in grassy York gum and Flooded Gum woodlands that easily absorbed the floodwaters.

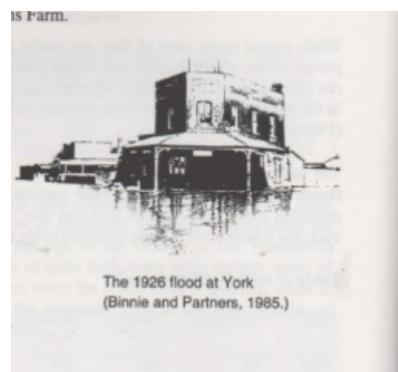
The trouble was, the early settlers did not properly allow for this, and the river towns, York and Toodyay especially, were built right on the floodplain. Moreover, those floodplains comprised rich alluvial soil and were the first to be cleared and converted into cropland and pasture, no longer able to absorb or ameliorate a flood. The river towns along the Avon suffered major flood damage in 1920s and again in the 1940s and minor flooding nearly every year.



*Images of York (left) and Toodyay (right) in the wake of Avon River flooding*

Floods (like bushfires) are natural events and are of no concern to an environment which has evolved in their presence – but they threaten and damage human assets. Severe, repeated flooding of York, Northam and Toodyay was unacceptable to the people who lived there and suffered the damage.

Two images that sum it up:



*The old pharmacy at York – as it is today (left) and as it was during the 1926 flood*

Flooding of the Avon also resulted in the flooding of the Swan River, one of the worse occurring in 1926 when much of the suburb of South Perth went under water and the Fremantle Railway Bridge collapsed. A serious Avon River flood in 1955 almost inundated the very area on which we are having this meeting tonight.

### **The River Training Scheme**

So, in the late 1950s, the Government decided to take action on flood mitigation. It was done with ruthless efficiency. They sent in a fleet of bulldozers and set about turning the Avon River into a drain. It was a massive project, starting near Toodyay and extending all the way up to the Yenyenning Lakes, and down the southern branch to Cobbler's Pool. The idea was to get rid of all the natural obstacles and restrictions in the river, thus enabling floodwaters to rush to the sea.

In terms of reducing flood damage, the River Training Scheme was a success, at least in terms of ameliorating minor flooding ... it is yet to be tested by a 1:100 years flood event. However, in terms of conservation of the river and its ecosystems it was a disaster. Sediments that had lain on the river floor since geological time were suddenly disturbed and mobilised. Nearly all of the wonderful river pools were filled in; today only one really good pool survives (and that has been excavated), the rest are just basins of coarse sand and silt. Kilometres of pristine riverine vegetation was flattened and has never recovered.

The scene below shows a section of the river which was formerly a braid, with several streams filtering through stands of ti-tree and sheoak. After training, the natural river was converted into a man-made canal, or a drain.



Today, when it flows in the winter, the Avon River is no longer a sedate stream, but it rushes in a violent torrent, and not only is the water salty but it carries a huge sediment load. You can see this in the dark-brown colour of the Swan River after every major winter storm, a stain that extends out into the Indian Ocean at Fremantle. This stain is topsoil, eroded from farm paddocks and gravel roads in the Avon catchment and carried away by a river with no filters or obstacles.

There were few people to object – most thought it was a good idea. One protest came from farmer Jim Masters, the “Grand Old Man of the Avon” who lived on the river between Northam and Toodyay and who had studied the river over a lifetime, and understood its moods and was an authority on its wildlife. Jim was an outspoken defender of the river; indeed he actually stood in front of a bulldozer at one stage, and he finally got his message across – but by then it was too late. His was voice in the wilderness; environmental protection a thing of the future.

Good people have tried to repair the Avon over the years, but mostly this has been through the efforts of unpaid volunteers. One government did a bit in the 1990s (pressured by the river Shires, and led by farmers Fred Bremner and Doug Morgan), when they created the Avon River Management Authority, but a later government shut it down and today there is not a single government agency that carries out any active conservation or recovery programs on the Avon. Some good work is done by small voluntary groups like the York River Conservation Society and the Toodyay Friends of the River, but they have no real resources, nor do they have the capacity to undertake the sort of large-scale projects that are needed.

### **Can salinity be fixed?**

My view is that there is no simple short-term solution to the salinity problem of the Avon River. Replanting about 70% of the wheatbelt with trees would do it, but this is not going to happen. Eventually, equilibrium, and a return to a freshwater river might occur in about 500 years-time as historic levels of salt are flushed out of the system.

### **What about the river pools and riparian vegetation?**

The pools and riparian ecosystems could be repaired. From a technical viewpoint we know how to do it, and it could even be close to cost-neutral if the sand deposits filling the pools were regarded as a commercial resource and mined, and the royalties put back into river conservation projects. Recovery Plans have been written and approved but are sitting gathering cobwebs on bureaucratic bookshelves.

But tiny groups of volunteers, no matter how dedicated, cannot achieve the sort of large-scale, coordinated and comprehensive recovery programs that are needed. This will only happen when the government finally takes responsibility for the mess it created and provides the necessary funding and impetus ... and that will only happen when the people of suburban Perth care enough to activate

their politicians. At the moment, nobody cares. Waterways conservation is not a popular issue – the environmental activists are all focused on saving the forests from timber cutting or on curtailing responsible bushfire management - this is ironic because the forests were saved 100 years ago and it is responsible bushfire management that ensures their conservation. Most residents in the Avon Valley these days look at the Avon and have no idea that it is a degraded vestige of a once wonderful river. They see no need for urgent action. Nobody under the age of about 100 remembers the beautiful river pools or regrets their loss.

I am sorry to be depressing, but the story of the degradation of the Avon River is a tragic one, made doubly so by the failure of government to address the consequences of the ill-advised River Training. I accept that the scheme was instituted with the best intentions – to mitigate flood damage – but the consequences went far beyond that. Reversing the environmental damage to the river system, while still mitigating flood damage, should not be beyond the capability of an intelligent, dedicated community.

**But the coin has another side.**

Don't despair! The coin has another side and a happier one. From water I would like to move this discussion to trees. The two are linked: too-little water (very low rainfall) in the catchment of the Avon has had one wonderful outcome: the evolution of the waterwise vegetation of the region. One of the glories of southern Western Australia is our native flora – known far and wide for its beauty and botanical interest, but also famous for its toughness and resilience. Nowhere else in the world do we see tall forests growing in areas subjected to annual drought and with an annual rainfall of about 100mm, as we do in the goldfields and the scattered reserves of the wheatbelt.



*York gums growing at Yilliminning – nowhere else in the world would tall trees like this occur in such low rainfall area*

Our waterwise trees are truly remarkable. They have adaptations that enable them to harvest every last drop of moisture from the soil, they can close down their evapotranspiration, and they can take immediate advantage of occasional good conditions to regenerate prolifically.

I will never forget the first time I came to appreciate this. Back in 1975 I undertook an extensive field trip of the eastern goldfields, to the north and east of Kalgoorlie. It was at the end of a prolonged drought. Scarcely a drop of rain had fallen in these areas for over five years. Yet the salmon gum and gimlet woodlands looked magnificent. Every tree was a mass of foliage, soaking up the sunshine and looking in tip top shape. At the same time the European gardens and orchards were either dead or dying or sustained only by artificial watering.

We have been planting waterwise trees on our property on the banks of the Avon south of York since 1990. The salmon gums, York gums, gimlets, morell and many others, are very beautiful – but they are also extraordinarily tough. Every year they must put up with about a six-month drought and searing summer temperatures, and every winter they are beset by heavy frosts and an occasional flood -but they seem to enjoy it. On top of everything, our trees are easily capable of surviving or recovering from bushfires, flood and storm; many tree species are even salt-tolerant. These tough and beautiful trees are now being planted on farms and as ornamentals in country towns, and they do so with almost no care, once established. And they have been a boon overseas, helping with reforestation and rehabilitation of degraded and salty land in arid climates in India, Pakistan, north Africa, Israel and several south American countries.

The trees of the Avon catchment are today helping to rehabilitate degraded landscapes all over the world, to say nothing of providing a welcome resource of firewood and timber.

Some people think that the world is going to become hotter and drier in the future. If this grim forecast unfolds, the waterwise trees of Western Australia will become even more important ... but even if it doesn't, how lucky we are to be able to plant and appreciate such wonderful trees.



*30-year old salmon gum on our property at Gwambygine*

### **Concluding remarks**

Thus the story of the Avon River, and of the region through which it flows, is both a sad and a happy one, and the two extremes share their relationship to water – too much of it has resulted in the degradation of the river and of wheatbelt soils as a result of salinity and sedimentation; but too little water has seen the evolution of some of the worlds most beautiful and toughest trees, which are contributing to environmental repair all over the world even, I am happy to say, in the catchment of the Avon River where sensible land-owners are now planting trees instead of clearing them.

I will leave you with this image of a gimlet tree I planted about 15 years ago on the floodplain of the river: a thing of beauty, but also a symbol of what can be achieved in the Avon valley, both to create beauty and to rehabilitate the Avon River.



*Postscript: this is a transcript of a talk I gave to the Royal WA Historical Soc when they visited York in 2022, and which I upgraded as a presentation to the Friends of the Battye Library and the Guildford/Midland Historical Society in September 2023*

*Roger Underwood AM was a member of the Avon River Management Authority for seven years and wrote recovery plans for four sections of the Avon River*