

GETTING MOORE TO THE POINT

TRANSFORMING TO OUTCOMES FOR THE MOORE CATCHMENT



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Where are we heading?

The Moore Catchment is a very rewarding place to live, work and recreate. It has generously supported every aspect of our rural lifestyles.

However, the catchment is now sending us strong signals that it is out of balance, not just on an environmental front, but economically and socially too.

Sediment is choking our creeks and rivers, salt is scarring our landscape, while commodity prices are falling and schools are closing.

Do we throw up our hands and proceed as though it's 'business as usual'?

No!

And how will we get there?

First off, we need a recipe that we all understand and accept, and that delivers the appropriate end product.

Put simply, there is no point giving people a recipe for a cheesecake when all they



Ready to cook up a storm?

Do we walk away and say that this is nature's way of telling us that we don't belong here?

No!

Perhaps we are ready to acknowledge that we have all the necessary ingredients for a prosperous and sustainable community, we just need a different recipe.

Yes!



Water, a vital ingredient but a fragile resource.

really want is scones. At the same time there is no point cooking scones if you are preparing a dinner banquet.

This document contains a recipe that uses local ingredients and will appeal to the tastes of the Moore Catchment community. For it to be successful, the ingredients need to be mixed in the right order and in the right proportions. Furthermore, with cooking comes washing and wiping up — jobs we all try to avoid!

Once the community is committed to this document, it is likely some people may wish to add to it.

That is okay. It is like someone wanting to make raisin scones rather than plain scones, and we know that at the end of the day we are just increasing the versatility of the recipe.

MOORE RIVER CATCHMENT

MOORE RIVER CATCHMENT

- Covers more than 14,000 square kilometres of land in the Shires of Gingin, Victoria Plains, Dandaragan, Moora, Dalwallinu, Coorow, Carnamah and Perenjori.
- Has a total population in the order of 15,000 people.
- Provides over nine per cent of Western Australia's gross value of agricultural production.
- Is an investment base for local, interstate and international businesses.
- Supports industries such as tourism, retailing, forestry and resource extraction.
- Is part of the South West Botanical Province which has the greatest native floral diversity in the whole of Australia.
- Is a high priority area for water resource management.

General Approach

A multitude of organisations in Western Australia are concerned with community development, either in a voluntary capacity or as part of a government program. Generally these organisations are doing a competent job in their specialist field.

Unfortunately, when they are transferred en masse to a rural community, it creates an overload of committees, stand-alone reports, recommendations and funding options.

This is of great concern, as rural communities cannot afford any duplication of effort. Resources, especially people, are at a premium. Take the Moore Catchment as an example — it is over two and a half times larger than

the Perth metropolitan area but its population is only one per cent of Perth's. Given these factors, the Moore Catchment Group initiated the development of an overarching strategy (i.e. considering the environment, economy and people as interrelated entities), which is highly focused and catchment specific.

The direct and streamlined approach taken in the development of this strategy gave rise to its title 'Getting Moore to the Point'.

Reasons for Developing a Strategy

What is a strategy?

Is this just another mumbo jumbo word that fits into the bureaucratic demands of our time?

No. It is our recipe for success.

The term strategy was originally used in relation to warfare, and meant the 'art of planning and directing the larger military movements and operations in a campaign or war'.

Are we fighting a war? Well the analogy has already been made. Take recent news headlines: 'The war against salt', 'The fight against rural population decline'.

And the stakes could be just as high. There is the potential for our catchment to turn into an inhospitable, barren wasteland. Take a photo of a bombed area in Europe during the First World War, and it looks very similar to a salt-scalded area in the Western Australian wheatbelt.

Similarly, the casualty list will be just as high for biodiversity. It is estimated that 450 endemic plant species will be lost from our wheatbelt as a result of salinity.

It is the belief of the Moore Catchment Group that many strategies have not been implemented because, while they are 'overall plans', they are not sufficiently responsive to the current situation. For instance, a feature of planning exercises is setting up a 'vision for the future'. Nine times out of ten, the vision is unrealistic, ignoring the environmental, economic or social constraints already existing in the region.

To move forward, the community must accept the past, deal with the present and prepare for the future.

The Moore Catchment Group views a strategy as 'the skilful management of a situation': a situation we have now, and one that we need to address urgently to safeguard our future.

THE MOORE CATCHMENT GROUP

A community initiated group, taking a coordinated and cooperative approach to rural planning and management.

It has broad community representation, with two members from each of the eight constituent shires: Gingin, Victoria Plains, Dandaragan, Moora, Dalwallinu, Coorow, Carnamah and Perenjori.

The Moore Catchment Group receives a yearly operating grant from the Water and Rivers Commission. It is also sponsored by other state departments and local government authorities.

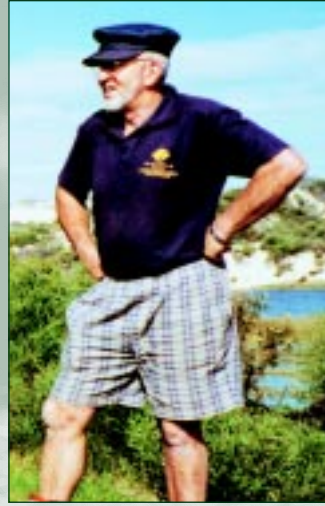
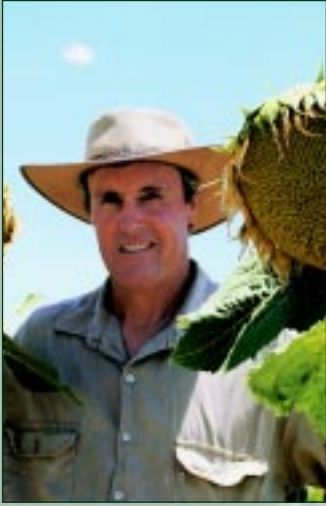


Scene from the First World War, Pontoon Bridge Heilly.



A salt-scalded paddock in the Moore Catchment.

No matter what hat you wear in the community



This strategy belongs to you

Because ... every individual, family and organisation has a hands-on role to play in the future of the Moore Catchment.

Because ... the sciences, arts, social groups, educational institutions, media, businesses and governments are all called on to offer creative leadership in implementing this strategy.



The Moore Catchment Group has reviewed many strategies from Western Australia and interstate. Unfortunately, not one adequately fits our needs.

Some strategies were divided into specific issues (e.g. soil structure decline, drainage, algal blooms). However, this exacerbates the problem of not looking at the connection or wider impact of different actions.

Some strategies were divided into themes (e.g. land, water and biodiversity). However, this leads to excessive duplication and discourages integration between government departments and community groups.

Other strategies were divided according to specific outcomes or targets. In general, people living in the catchment would find it difficult to relate to them because they were too technical or only took an environmental perspective.

This strategy is unique!

The strategy follows three principles:

1. Outcomes focus on the connections people have with the environment

The Moore Catchment Group is committed to making a difference to the lives of people in the region. To do this it is vital that the community is considered in a dynamic and interconnected social, economic and environmental setting.

For this strategy to be adopted it really needs to put more of a human face to natural resource management. After all, it is people, not a slender tree frog, who will implement the strategy.

This doesn't mean following in the footsteps of our industrial forefathers — it is about rediscovering how we are intricately linked to the environment we choose to live in.

In particular, this strategy critically examines the connection that people have with the landscape, soil, water supply,

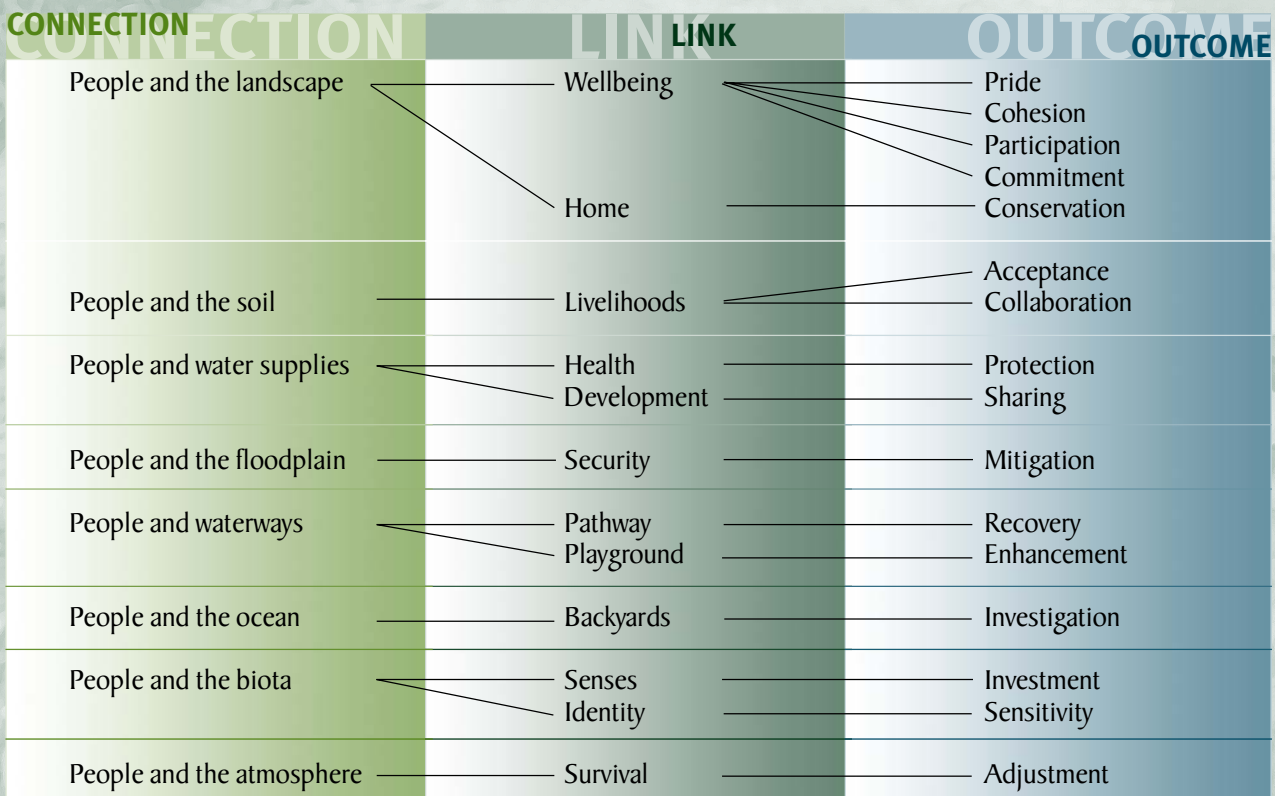
floodplain, waterways, biota, ocean and atmosphere.

It should be noted that each connection is considered to have equal importance. We then took this concept a step further (see diagram below).

For each connection we identified where the Moore Catchment community relied most heavily on the environment. For instance, the strongest links people have with the landscape is through their wellbeing and their homes, while the strongest link people have with the soil is through their livelihoods.

We then decided how to improve each link. This approach will guarantee people-related outcomes such as pride, cohesion, participation, commitment, conservation, acceptance, collaboration, protection, sharing, mitigation, recovery, enhancement, investigation, investment, sensitivity and adjustment.

The desire for balance is being echoed across Australia. The Moore Catchment now has the opportunity to be at the forefront of achieving this goal.



‘Fixing up our catchment is not just about the environment. It requires finding a balance of managing the environment, the economy and communities — an integrated approach. Improving our catchment is therefore a very human activity. It involves people; it is done by people and, at the end of the day, it will benefit people.’

Adrian Wells, resident of Wodonga, Victoria

2. Strategies focus on achieving the stated outcome

The ‘sustainability’ movement has been characterised by a reflective learning culture resulting in gradual changes over time. Reasons for slow progress on achieving sustainability may be that: i) it takes time for groups of stakeholders to plan and coordinate activities; ii) there are time-lags before results are evident; and iii) economic disincentives operate at all levels.

Instead of overlooking these social barriers, we need to carefully identify our priorities and evaluate the opportunities and constraints operating in the Moore Catchment.

Every desired outcome has a set of strategies to support it. The strategies have been developed from a careful evaluation of local, regional, state and national issues.

As opportunities and constraints change over time, it is expected that the strategies will need to be updated in the future. This should be done at least within the next 15 years.

3. Strategies bridge the gap between government and community

An interface represents a transition zone between two or more discrete entities. Strategies that focus on the interface have the potential to be more effective and cost efficient.

We see this in nature.

At all ecosystem levels, nature is conservative with its inputs and outputs. This is possible because all exchanges happen across an interface. At a microscopic level, the cell membrane is a selective barrier to the movement of solutes. At a landscape level, vegetated river foreshores are a barrier to nutrient and sediment movement into waterways. Humans have upset the balance of inputs and outputs. Our biggest mistake in attempting to restore the balance has been to try to make small changes across the entire landscape.

This is largely an artifact of the way government assistance has been administered. Throughout the decade of Landcare hundreds of community groups have competed for a small share of the funding pie. Government agencies have also competed for their share often getting larger projects funded. These have been criticised for not engaging local communities.

It is obvious that this approach is not having the desired outcomes. Pumping more dollars into it, at the expense of other community needs, is not the answer. To get value for money, Commonwealth and State Government funds should be directed towards supporting locally driven efforts in priority areas.

This doesn't mean shifting responsibility directly to local government. While it has

an expanding role in many areas it is unable to continually accept new responsibilities and deliver effectively without adequate resources. Local government's share of Commonwealth taxation revenue has fallen from 0.92 per cent to 0.59 per cent in 15 years while its responsibilities have increased from the provision of fundamental infrastructure, such as roads, to include environmental management, social services, economic planning and more.

The real solution is to develop an efficient and effective interface between government and the catchment community. The Moore Catchment Group has a vital role in making this happen.

Why aren't actions included in this document?

Armed with this strategy, the Moore Catchment Group will be in a good position to help the community and local government establish a set of clear actions to achieve each year. It can lobby government to build true partnerships and provide access to coordinated programs, information and expertise.

In order for us to keep our finger on the pulse and keep things happening, the action list needs to be updated on an annual basis. The strategy document clearly has a much wider scope than individual actions. It is also written to provide guidance over a longer period of time.

The ‘who, when and how’ are more effectively negotiated with stakeholders at a sub-catchment or local level.

Taking this approach will also allow relevant actions to be incorporated into the annual business plans for local authorities and government agencies.

Connections, Links and Outcomes

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We are linked to the landscape through our wellbeing and our homes.

1. Our Wellbeing

'If I could pick only one thing that makes the Moore Catchment special, it would have to be the generosity of the people.'

What exactly is wellbeing?

It is a term that sums up all the feelings related to being happy, healthy and prosperous. Stress is defined as any interference that disturbs a person's wellbeing. In the long term it can lead to illness and social problems.

How stressed out are rural people?

Fears have been expressed that isolation, the rural recession and a sense of loss amongst country people will fuel unprecedented levels of alcoholism, drug abuse, depression, suicide and emotional disturbances, and will have a resounding impact on Australia's economy for years to come.

The media have focused on a 'crisis in the bush' and 'dying' rural towns, and highlight the widening disparities between metropolitan and country areas.

It is difficult to find reliable data in WA that compares the stress levels of rural and city residents.

However, a one-off survey conducted by the South Australian Health Commission provides some insights. Derived from 3,000 interviews the findings showed a slight tendency for people in country regions to suffer from lower levels of stress than their metropolitan counterparts.

Of all those whose stress levels had changed, people in the country tended to attribute the change to someone close to them getting sick or dying, whereas metropolitan respondents were more

likely to suffer stress as a result of an increase in workload or the loss of employment.

This could support the notion that the rural sector is more closely associated with the idea of community. Rural people know who their neighbours are, they recognise you when you walk down the main street, and they'll notice your absence at the last Rotary meeting.

Because strong social networks exist in rural areas, a sense of place is extremely important. It establishes what is distinctive about the local area and its people. It helps people understand what kind of community they live in, what it was and what it hopes to become.

According to Associate Professor David Goldney of Charles Sturt University, 'Going to rural Australia could soon be like going to a Macdonald's restaurant — you could be anywhere in the world. We are losing the landscape.'

He refers here to the loss of diversity in the landscape — which can be both natural diversity (e.g. bushland sites) and man-made diversity (e.g. the architecture of different towns).

A person from Geraldton remarked that she could not imagine driving along the Midlands Road without the majestic Salmon Gums. Likewise, a wheat silo is a familiar landmark for many towns in the Moore Catchment.

The only way to simultaneously preserve our natural and agricultural assets into the future is to modify the way we interact with the landscape. In the early days of settlement the Midland Railway Company marketed its subdivisions as 'unlocking the land'. Now, with our collective experience, it should be about 'working with the land'.

It is time to plan for the future and to

'Never doubt that a small group of thoughtful, committed citizens can change the world; indeed it's the only thing that ever has.'

Margaret Mead, anthropologist

agree on expectations about people and the landscape: we can either accept further deleterious changes, maintain the current status or look for improvements.

Wubin farmer Helen Nankivell believes 'it is time now for the Moore Catchment to pull together so that each person is vitally aware of what is going on one kilometre away, 10 kilometres away, 100 kilometres away — right down to the sea.' A dynamic and successful catchment community will have the following features:

- * It will have a realistic perspective on its particular circumstances.
- * It will be willing to identify, develop and pursue unconventional solutions — new problems may require new solutions, but too often the same approaches reappear.
- * It will show frugality and tight management to carefully allocate limited resources.
- * It will communicate its needs to people outside the region who can offer assistance — the ability to gain external support for local innovations is often vital for providing seed funds.

GETTING MOORE TO THE POINT

To improve wellbeing we need to build a sense of pride and cohesion and encourage greater participation and commitment in the Moore Catchment.

Pride is about having a positive identity ... and discovering that our land and culture are worth celebrating for a wide variety of reasons.

Strategy 1

Raise awareness of our natural and cultural features in order to foster a sense of belonging in the Moore Catchment.

Strategy 2

Build leadership capacity and group skills within the community so that ambitious and innovative projects are undertaken in the Moore Catchment.

Strategy 3

Find interesting ways to promote the Moore Catchment in order to involve locals and attract people from outside the area.

Making a difference in the Moore Catchment

TOWN HONOURS HORSE POWER

A life-size Clydesdale working with the being moulded in a backyard studio will be horses.

‘You’d yoke them up, stand up on board and shout, “Righto boys, here we go”,’ Mr Tonkin, 87, said.

‘It was a marvellous feeling to be working 12 horses in a team.’
Sculptor Robert Hitchcock kneaded and scraped the final details into the monolithic horse as the man who pushed the idea, Roger Tonkin, recalled

‘All the early

working with the horses.

Mr Tonkin said the monument, to be cast in bronze with a sculpture of a sheep dog, was overdue.

‘All the early



Federation Park Statue

development in our area was done with horse power,’ Mr Tonkin said. ‘Tractors didn’t come in till after World War II and by that stage all the heavy land had been cleared.’

Outcome 2- Cohesion

Cohesion is about sticking together... and discovering that our land is the common ground for the community

Strategy 4

Facilitate open lines of communication in order to provide avenues for expressing the diversity of interests in the Moore Catchment.

Strategy 5

Support families in their nurturing and educating roles in order to recognise how important they are to the social fabric of the Moore Catchment.

Strategy 6

Coordinate government policies, programs and agencies operating in the Moore Catchment to increase efficiency and achieve outcomes desired by the community.

Making a difference in the Moore Catchment**We're staying, say Gingin locals**

The residents of Gingin were in no mood to shift yesterday as they shrugged off a suggestion by Victorian academic Gordon Forth that communities with populations below 4000 should be allowed to die.

Business proprietors in Gingin, 84km north of Perth and population 615, laughed.

Publican David Moffat, who moved to the town just over a year

ago and has invested heavily in the Gingin Hotel, is confident of the small town's future.

He said farm diversification and its appealing lifestyle had pushed the

population up in the past year.

Robert and Teresa Ford, who also moved to the town a year ago, believe their bakery and cafe business the main street is more profitable than similar businesses in Perth.

Jock Butler, who runs the liquor store and has lived in Gingin for 49 years, said Dr Forth's comments undermined the spirit of Australia.

'There's more to life than economics and you need people living in country areas,' he said.

Gingin Shire Council chief executive Simon Fraser said the shire's population was growing and its rural industries made significant contributions to WA's economy.



Gingin business owners.

Participation is about sharing the load ... and discovering that every individual, group and organisation is a vehicle for positive change within the catchment.

Strategy 7

Promote images of neighbours and groups taking action to improve the Moore Catchment in order to encourage greater community involvement.

Strategy 8

Actively harness the skills and resources already available in the Moore Catchment in order to develop self-reliance and continuity.

Strategy 9

Give greater recognition to the voluntary contributions of community leaders and representatives in the Moore Catchment so that the associated costs to family, work and leisure time are acknowledged.

Making a difference in the Moore Catchment

GIVING UP THE GHOST

When the bank closed down in Carnamah, nearby Coorow was affected since the bank had sent staff from Carnamah to operate a part-time agency. When announcing its decision to leave, BankWest offered the Shire of Coorow the opportunity to act as an agency, an offer the Shire accepted.

BankWest provided a teller counter with cash drawer, a safe, a hyperterminal (similar to an EFTPOS machine), stationary, cash for a float, signs, staff training and the installation of a dedicated

telephone line for use with the hyperterminal. The bank also agreed to meet the cost of all postage and small expenses and to pay the Shire 60 cents (now one dollar) per transaction.

The bank's customers can now conduct electronic cash withdrawals, deposits, transfers and balance queries using cards, as well as make cheque deposits and manual cash withdrawals at the agency. Transactions are not restricted to just the original bank's customers. Clients of a number of other banks are permitted to make electronic withdrawals. The agency also can issue bank cheques and cash advances on credit cards to all customers irrespective of their



Main street in Coorow.

bank.

The agency has created a valuable service to the Shire's residents at no financial risk to the Council. Several intangible benefits have evolved through less travelling to other towns, with obvious benefits to Coorow's businesses. Also, office staff have widened their knowledge and skills with the banking services which could be of benefit later in their careers.

Outcome 4 – Commitment

Commitment is about believing in something ... and discovering that our land provides an indispensable array of opportunities.

Strategy 10

Focus on opportunities that benefit everyone from seniors to young people in order to build a stronger and healthier community.

Strategy 11

Promote alternative and value-added agricultural and home-based enterprises that have positive economic, social and environmental returns in order to encourage long-term diversification in the Moore Catchment.

Strategy 12

Acknowledge, harness and enhance the efforts and potential of local businesses and service providers to create opportunities within the Moore Catchment.

Making a difference in the Moore Catchment

Country towns working to attract key workers, trades people and professionals to their communities were given a boost today when the State Government announced the allocation of \$2 million in grants to provide a better standard of housing.

The following shires will receive grants of \$50,000 for one house: Boddington, Brookton, Bruce Rock, Chittering, Corrigin, Dalwallinu, Dandaragan, Goomalling, Irwin, Kondinin, Kulin, Laverton, Merredin, Mingenew, Moora, Morawa, Mukinbudin, Mullewa, Nannup, Narembeen, Perenjori, Pingelly, Quairading, Ravensthorpe, Shark Bay, Three Springs, Trayning, Upper Gascoyne, Victoria Plains, Westonia, Wickepin, Williams and York.

In addition, a total of \$350,000 has been allocated for a doctor's house in Merredin, two additional houses in



New houses being built in the Shire of Victoria Plains.

Moora to assist businesses, Three Springs for a doctor or community health sister, Perenjori for a mining company employee and the Shires of Shark Bay and Mullewa for additional dwellings for small and remote communities.

According to Shire of Moora CEO, Peter Stubbs, housing is the most direct way of injecting capital into an economy, particularly that of

Thirty three country towns allocated Government funds for new houses

a small to medium sized community.

'All major employers in the town interviewed to date have stated that the single most important issue in attracting and retaining quality staff was the standard and price of housing, both from a rental and purchase perspective,' Mr Stubbs said.

'The proposal to commence a program of regularly building and replacing new executive quality accommodation provides council with the opportunity to take a leadership role in jobs creation and economic growth in the Shire of Moora,' Mr Stubbs said.

II. Our Home

‘Considering the region’s accrued wealth and today’s high standard of living, it would be difficult to find a “humble” abode.’

People, like all other animals, need shelter, food and water to survive.

Across the developed world inhabiting a permanent dwelling — the home — has satisfied the need for shelter. Food and water are supplied to the home via an intricate network of utilities, transport routes, industry and businesses. On a micro-scale we could liken this to the functioning of an ant nest.

In Australia, people’s homes go above and beyond satisfying basic needs. Today a home represents a certain quality of life with comfort and convenience being the major considerations.

Keeping up with the ‘Jones next door’ has resulted in a pattern of increasing per capita consumption and an associated increase in the production of waste.

To appreciate the magnitude of household consumption, we can draw on the concept of ecological footprints. This is a measure of the area of land needed to sustain a person’s standard of living by supplying the resources they consume and assimilating any waste they produce. According to the Australian Bureau of Statistics, Australians have the second highest ecological footprint in the world at a staggering 4.4 hectares per person. With almost three million tonnes of solid waste going to landfill each year in Western Australia, it is about time we critically examined consumer behaviour. Most of us understand the concepts of reusing and recycling items and can readily identify fairly easy steps to take in these efforts — we can reuse a bag or drop an aluminium can into a recycling bin. These steps cause little disruption in our daily routines and provide highly

visible evidence of our efforts.

Programs such as Drum Muster have been popular in the catchment. The Dalwallinu recycling depot has 60,000 chemical drums on site after 12 months of operation. One problem encountered is that drums have not been triple rinsed before being dropped off. Several Shires have also purchased wood chippers to reduce the amount of garden waste going to landfill.

Source reduction is different. It involves tough consumer decisions based on rating products or services according to their efficiency in resource use, such as



Coorow tip site.

choosing concentrated washing detergent in smaller packages, or using solar power instead of electricity to heat household water.

Source reduction offers the greatest potential for conserving resources and eliminating waste. However, the success of any source reduction strategy will depend on consistent and reliable consumer information being well promoted. For instance, a new labelling scheme jointly developed by the Australian Greenhouse Office and the Department of Transport and Regional Services will enable new car buyers to compare vehicle fuel efficiency at a glance. In 1998, the transport sector accounted for 72.6 million tonnes, or 16 per cent of Australia’s total greenhouse emissions.

Rising oil prices and the need to limit emissions of greenhouse gases are also focusing attention on opportunities to make greater use of renewable energy

‘If we forget that packaged eggs or hamburgers came from animals, a cotton shirt from a plant, a wooden chair from a tree, then we have lost that connection with nature.’

David Suzuki

sources. Plant biomass is a promising source of energy for the Moore Catchment; it can be converted into a range of energy forms including electrical and heat energy, liquid and gas fuels and charcoal.

In Europe it has been projected that 31 per cent of their renewable energy will be derived from plant biomass. In Australia, biomass is expected to play a large part in meeting the federal Government’s target of increasing energy production from renewable sources by two per cent by 2010.

Planting oil mallees has already started in earnest in Western Australia’s wheatbelt with 17 million trees in the ground. An integrated wood processing demonstration plant is being developed at Narrogin. It will produce electricity, with activated carbon and eucalyptus oil as commercial by-products.

The oil mallee industry also offers the opportunity to develop more distinctively Australian products that are compatible with our landscape. According to one wheatbelt farmer, oil mallees planted in alleys vastly improves the workability of the land and the aesthetics of the farm.

GETTING MOORE TO THE POINT

To improve our homes we need to change our habits to CONSERVE our natural resources and find innovative ways to recover energy, water and other materials.

Outcome 5 – Conservation

Conservation is about using resources responsibly ... and discovering that with the environment we can't afford to rob Peter to pay Paul.

Strategy 13

Trial environment-friendly technologies in the Moore Catchment in order to encourage future investment in sustainable resource use.

Strategy 14

Engage households, businesses and industry in source reduction practices in order to lessen the impact of the Moore Catchment community on the environment.

Strategy 15

Find practical ways to overcome the barriers for recycling, reuse and cleaner production in order to fix leaks in the human consumption chain.

Making a difference in Western Australia**WA mallee energy plant a first**

Australia's first mallee tree-powered energy plant has finally been given the go ahead following the allocation of \$5 million toward its construction.

Owners and operators Western Power will be spending \$3.34m to build the plant in the wheatbelt town of Narrogin. This will be matched by a \$1.76m Federal Government contribution.

The Australian Greenhouse Office has granted \$1m to the project and AusIndustry (Department of Industry, Science and Resources) has shown its support with \$760,000. The Integrated Wood Processing (IWP) demonstration plant will produce electricity from

locally grown oil mallee trees, with activated carbon and eucalyptus oil as by-products.

The public won't have to wait for long for results because plans are in place to have the project operational by February 2002, at which time it is expected to produce enough electricity for 1000 homes.

Western Power Corporation managing director David Eiszele is confident the technology has strong commercial potential.

However, he said Western Power would continue to work closely with the Oil Mallee Company to assist local farmers develop commercial mallee crops.

'The role of the Oil

Mallee Company and local farmers cannot be underestimated if we are to develop substantial mallee plantations to support a sustainable bioenergy industry in WA,' Mr Eiszele said.

To produce an equivalent amount of energy, a conventional power plant would emit as much as 7300 tonnes of carbon dioxide a year. In addition to this saving, the IWP plant's mallee plantations will absorb an extra 4300t of carbon dioxide per year.

Both Mr Eiszele and WA Energy Minister Colin Barnett believe the innovative project would deliver competitively priced renewable energy. They

believe the IWP plant will directly address two of Australia's most serious environmental concerns — farmland salinisation and global warming.

The demonstration plant is set to be the forerunner to several full scale, five megawatt plants.



Oil mallee planting in the wheatbelt.

1. Our Livelihoods

‘In true Aussie spirit we have branded our efforts to control land degradation as the ‘vegemite approach’. It’s been a case of spreading too little, too thinly.’

In physical terms, soil can be described as a thin layer of biologically active material lying over rock. It is the result of complex processes of geologic weathering, nutrient cycling and biomass growth and decay.

Soil is the primary environmental stock that supports agriculture. Good soil condition is central to determining the current and future productivity of agriculture. It also greatly influences the cycles of energy, water, nutrients and carbon.

Natural weathering processes and human use have brought about continuous changes in soil quality. The deterioration over time of key soil attributes required for plant growth, or for providing environmental services, constitutes ‘degradation’. The key soil degradation processes are salinity and waterlogging, erosion by water or wind, compaction and hard setting, acidification, loss of soil organic matter, soil nutrient depletion and soil pollution.

Different land management practices are associated with different types and degrees of soil degradation

So should our ancestors have known better than to clear vast tracts of the south-west of WA for agricultural production?

In all fairness, no. In geologically young areas of the world such as Europe and North America, replacing a swathe of woodland with a field of grain would only bring a few environmental penalties such as soil erosion.

In Australia, the soils are much older and hold less moisture, so in order to survive, a range of trees and shrubs have evolved with root systems that may go down 15 to 20 metres. This is deep when you compare them with a northern hemisphere oak tree that may have roots not much deeper than two to three metres.

So when agricultural grasslands started to replace our native woodlands, and 10 to 20 per cent of rainwater suddenly became surplus, it began to mobilise salt stored in the subsoil.

Where does the salt come from? It comes from the ocean, carried inland by the wind. Depending on location and soil type, between 100 and 1000 tonnes of salt are stored beneath each hectare of land in the south-west.



Salinity Mural on Moora Shire Office

It’s somewhat alarming that early and repeated warnings on the threat of salinity were ignored.

The University of Western Australia’s first professor of Agriculture warned a royal commission as early as 1919 that vast areas of the region dubbed the wheatbelt were unsuitable for clearing because of salt. The report of the Demptser Royal

‘No change takes place, no matter how clever the science, without profit, participation and politics. In many ways these are tougher mountains to climb.’

Richard George, Agriculture Western Australia

Commission stated that it would ‘not allow scientific prejudice to get in the way of developing our mallee lands’.

Railway engineers noted that their boilers were corroding and the water in dams built at railway sidings had become salty. Walter Ernest Wood published a scientific paper in 1924 that identified the source of salt, how it was stored and released and ways to rehabilitate degraded land.

Most of the Moore Catchment was cleared following the First and Second World

Wars. According to anecdotal accounts from the upper catchment, there was obvious water logging and salt encroachment after the wet years of 1963 and 1964. Trees in the flat valley floor started to die in the following years.

The rise in salt levels was evident in Moora’s waterways as early as the 1950s.

This caused problems with the railway dam and was of considerable concern to the Moora stationmaster, who regularly sent samples to Perth for analysis until diesel locomotives took over the route. Many of the farm dams and wells became useless as time went on and the summer river pools in the Moore River would kill young sheep if they had access to them.

The impacts were felt further downstream. A promising irrigation venture on the Moore River was disbanded in the 1960s. An agent's description of the Cowalla property in 1908 said: 'The estate is one of the most valuable properties in WA for extensive irrigation operations. There is an unlimited supply of fresh water, which has a perennial flow. The river is flanked by rich alluvial flats which are abundantly adapted for the production of maize, sorghum, millet, lucerne, paspalum, rye, couch and other grasses or clovers.'

It has only been in the last few decades that we have realised the dimensions of salinity. If the current levels of recharge continue, WA is set to lose as much as 6.3 million hectares or 30 percent of its agricultural land by 2050.



Bagging Rainbow Trout for trials in saltwater farm dams.

A survey of community attitudes in the Moore Catchment in 1999 showed that the respondents tended to agree with the statements that 'WA agricultural land faces serious degradation problems caused by clearing native vegetation', but were undecided about the statements relating to the area of agricultural land that will be affected by salinity.

Farmers have responded to government programs aimed at reducing groundwater recharge, although not on the scale recommended by hydrologists. This is not to take away from the considerable

'I came over to Western Australia an optimist and now I've had to compromise. It has changed the emphasis of the approach I now advocate, from fixing it all up to adapting to it.'

Tom Hatton, CSIRO.

personal sacrifices made in the decade of Landcare. For instance, the Moore Catchment is home to the inaugural John Tonkin Tree Award, given by Greening Australia in 1987 to the Ranfurly Park property owners.

Recent studies have shown that even if farmers had responded on the scale recommended, salinity would still be on the increase.

Initially, researchers over-estimated the amount of water used by trees and suggested that 20 per cent of the cleared land would need to be returned to trees. However, over the past two decades, more accurate means of measuring transpiration have prompted hydrologists to conclude that between 50 to 80 per cent of the landscape would need to be converted to trees or perennial pastures.

The community attitude survey showed that farmers had a diversity of attitudes towards the density of tree cover. In general, an increase to 20 per cent is valued but an increase to 50 per cent is not.

The scale of the problem is further exacerbated with very few economic options for salinity management in the low rainfall agricultural region. Approximately

Estimated current impacts of salinity in Western Australia

Impacts of salinity	Annual cost in millions of dollars in the year 2000	
	Best bet	Possible range
Agricultural land — opportunity cost of lost operating profit	\$80	\$80–261
Rural towns — Annuity of a 50 year discounted present value	\$5	\$2–16
Roads — Additional repair and maintenance costs	\$505	Not tested
Railways — Additional repair and maintenance costs	\$11	Not tested
Vegetation — Imputed cost of protection of 10% of affected areas	\$63	\$63–626

Source: R Short and C McConnell (2001)

50 per cent of the Moore Catchment falls into this category.

According to hydrologist Richard George, 'it appears that for much of the flat and lower rainfall areas, reclamation with the current recharge based options, while emotionally attractive, is not feasible in the short to medium term'.

Hence, there needs to be a greater emphasis on the development of improved technologies, both for salinity prevention and for adaptation to a saline environment.

Wubin farmer John Nankivell insists that 'there is a real need for research and development within the catchment as a whole, and in the outer catchment in particular. Farmers will be generous with their land and time if they can see something happening. But it has been difficult to attract either students or personnel.'

The proportion of the gross domestic product spent on research has dropped almost 10 per cent in two years to just 1.5 per cent. However, at a local level it is encouraging that the Liebe Group, a high profile research and development group, has formed to service the Shires of Coorow, Carnamah, Perenjori and Dalwallinu.

The University of Western Australia conducted an informal review of research and development priorities for salinity and concluded that the area with the greatest discrepancy between current effort and research needs is the design of new institutional arrangements and policies. Attitudes at the ground level reflect this need. According to Yerecoin farmer, Barry Johnson, 'farmers in the catchment often face personal conflicts of interest when allocating capital for on-ground rehabilitation works with no immediate return'. Wheatbelt farmers are calling for 'hands in the dirt help'.

The Commonwealth's National Salinity Action Plan has allocated approximately \$157 million over seven years. The Commonwealth, State and regional natural resource management groups and catchment communities are seeking a better framework and principles for directing the investment of limited public funds to the best effect.

The State, regions and catchments must work together to establish priorities for managing salinity.

Setting priorities will require consideration of the following criteria:

- * Asset significance (economic, social and environmental)
- * Urgency of remedial measures
- * Scale of intervention required
- * Feasibility of asset protection (biophysical and social)
- * Cost-effectiveness of intervention

Utilising these criteria has two important ramifications. First, the top priority public investments will be the ones that generate the greatest public benefit per dollar of investment. An example could be groundwater pumping to protect a town's infrastructure from salinity.

Second, direct financial assistance to landholders for on-ground works will be targeted to particular sites based on the net public benefits at those sites. An example could be engineering works to protect a lake of high biodiversity value. What happens when the public priority is low, but there are extensive private assets at risk?

In this situation payments targeted to whole-of-industry programs may be more appropriate. Funding could provide new tools, increase the profitability of existing tools or provide institutional reform.

For example:

- * Development and field testing of salt-tolerant plants.
- * Provision of infrastructure for processing woody perennials in the wheatbelt.
- * Development of new, profitable perennial-based farming systems.
- * Research and development on construction, monitoring and management of on-farm drainage.
- * Support for farmer groups such as the Oil Mallee Association, WA Lucerne Growers and the Saltland Pastures Association to demonstrate, test, improve and extend improved farming systems for salinity management.
- * Changes to land use planning controls to allow catchment land trading.
- * Rate relief.

Greater consideration is needed to determine the allocation of funds between direct support (targeted at specific locations/catchments) and indirect support (relevant across broader regions).

The spotlight is on salinity for the moment, but we must remember that management is also about maintaining the health of 70 per cent of the landscape that will not be significantly affected by salinity.

Soil acidification has been described as the 'sleeping giant' of land degradation problems in the State's agricultural area. This is because the process can be gradual

and invisible and require ongoing monitoring and remediation. A conservative estimate of the cost of lost production from soil acidification is \$150 per hectare.

Many of the soils in the wheatbelt are naturally on the acidic side as they have been exposed to extensive leaching and weathering over long periods of time. However, soil acidification is increasing as a result of current agricultural practices. The biggest problem is the leaching of nitrates from legume crops and pastures, as well as nitrogen-based fertilisers.

Soil acidification can be remedied or prevented by applying lime or dolomite as sources of alkaline material. It is encouraging to see an increasing number of Western Australian farmers respond to the problem, reflected by the record 653,000 tonnes of agricultural lime applied last year (see graph below). This is still short of the estimated 1-2 million tonnes needed annually to treat soil acidification.

Other problems such as soil structure decline, nutrient decline and erosion are closely related. In general terms, successful management practices maintain a protective cover on the soil surface, increase organic matter levels and minimise damage to soil structure caused by machinery and stock.

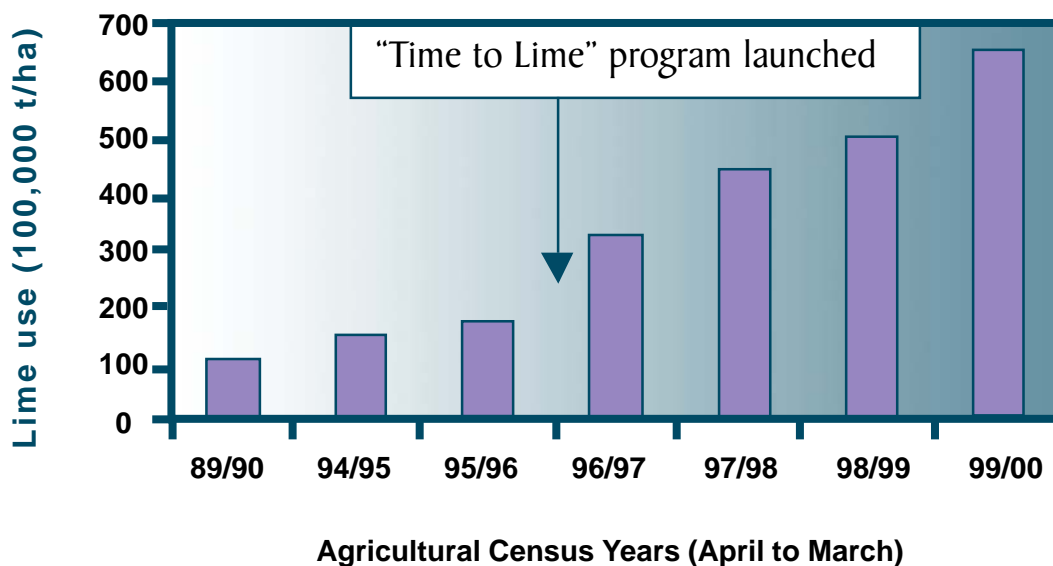
Significant improvements have been made in some areas. For example, farming systems that use minimum tillage or permanent beds have demonstrated advantages for improving soil structure and the suitability of soil habitat for earthworms and other organisms.

The challenge will be to keep soil conservation issues at the forefront as diminishing agricultural returns drive increased production. Where a soil conservation practice is profitable extension is needed to encourage farmers to take it up. This can be done by supporting production groups to demonstrate, test and extend improved production systems.

GETTING MOORE TO THE POINT

To improve our livelihoods we need to **accept** the hydrogeological features of our landscape and **collaborate** to develop technologies for adapting to it.

Lime use in Western Australia for Agriculture (includes all sources of lime)



Acceptance is about acknowledging the facts of a matter ... and discovering that it is better to be honest than beating around the bush.

Strategy 16

Emphasise the urgent need for conserving soil resources that will not be affected by salinity in order to safeguard a profitable and sustainable agricultural industry in the Moore Catchment.

Strategy 17

Communicate that in some cases dryland salinity will not be reversible in the Moore Catchment so that rural adjustment networks are put in place now.

Strategy 18

Ensure that the investment of public resources in salinity recovery, containment and adaptation in the Moore Catchment are made on realistic bases and address true management priorities so that the investment is effective.

Making a difference in Western Australia

Adapt to salt, says scientist

The Wheatbelt will never look the same again, according to WE Wood Award winner and salinity scientist Richard George.

But the Agriculture WA researcher said strategies had emerged to use the 30 per cent of land already lost to salt while also improving productivity of the 70 per cent that would not go salty.

Dr George is the second WA scientist to win the national award, launched by the CSIRO last year.

The inaugural award for excellence in salinity research and development in Australia went to Floreat-based CSIRO scientist Tom Hatton.

Dr George said that though salinity threatened a great deal of the State's landscape, there was land that would never be affected, and its conservation should be a high priority.

Many people expected the future to look like the past which, from a geological viewpoint, was ridiculous. This was not the first time big areas of the Wheatbelt had turned salty. Nor would it be the last. WA had a 5000 to 10,000-year salinity cycle.

Dr George said there were ways



Jumbo Sorghum seeded in January 2000 in the Wubin area to soak up water from seepage areas.

to profit from salinity problems. Next year, a network of bores would be installed within the towns of Merredin and Katanning to keep watertable levels down. Saline waters would be desalinated for use by industry and mined for products such as magnesium salts.

Extract from The West Australian, 2 November 2000

Outcome 7 – Collaboration

Collaboration is about pooling the community's energy and expertise ... and having the belief that it's 'one in, all in'.

Strategy 19

Collaborate with landholders to monitor soil condition and related inputs and outputs in order to provide essential data for identifying areas at risk of land degradation and assessing various treatments.

Strategy 20

Encourage strategic alliances or partnerships between Landcare groups, production groups and government in order to develop specific enterprise packages that farmers will adopt and that generate environmental benefits.

Strategy 21

Build new business opportunities from saline land in order to find innovative and profitable ways of living with salt in the Moore Catchment.

Making a difference in the Moore Catchment

LANDCARE GROUP RECOGNISED FOR DEVELOPING THE PERFECT PINE



John Longman, secretary of the West Koojan-Gillingarra LCDC, proudly holds the 2000 Rural Leadership Award

For the first time a Landcare group has won the WA Rural Leadership Award.

The West Koojan-Gillingarra Landcare Conservation District Committee won the 2000 Rural Leadership Award for working in partnership with the community and the WA Government to restructure the pine sharefarming scheme and provide better returns for all concerned.

It was widely recognised that the existing scheme was not being adopted in the district due to poor short-term economic returns.

Key LCDC members raised the idea of incentive payments for enterprise change.

Following negotiations with key stakeholders the scheme was adapted giving farmers an up-front payment for use of their land to grow pines.

The up-front payments were derived from cost savings by increasing the critical mass of trees being planted. This came about from the LCDC's proposal to increase the area planted from 1000ha to 4800ha in one year with virtually no extra cost to CALM.

The partnership has resulted in multiple benefits across the community, including

genuine environmental outcomes.

The new partnership has delivered:

- * 3 million pines in the ground delivering much needed environmental benefits such as reduced groundwater levels and reduced wind erosion.
- * \$320,000 in up-front payments for use of the land, providing a boost to land values and cash flows.
- * \$470,000 in local contract work planting seedlings and fencing.
- * \$112,000 invested for other Landcare and biodiversity objectives in the area.

According to Community Landcare Coordinator, Alexandra Gartmann, the project has opened people up to the idea of alternative farming systems and diversification opportunities.

'The LCDC has trialled and promoted numerous alternative pastures, grasses, tree crops, biosolids, rainbow trout and other "edge" ideas,' she said.

'While the idea of pine sharefarming is not new, the LCDC has been able to look at something that is already in place and view it with new eyes,' she said.

1. Our Health

‘Sir, can I interest you in a glass of our region’s finest drop – it’s extracted from the ground, just a few kilometres up the road.’

Could this be our future?

Maybe not. But keep in mind that we live on one of the driest continents on Earth and groundwater aquifers currently provide 47 per cent of WA’s public water supply. There is a greater reliance on groundwater in country areas, with 80 per cent of the public water supply coming from this source.

In the Moore Catchment alone, 10 towns rely on the Water Corporation’s public water supply well fields (see table below). Elsewhere, individual landowners generally have rain water tanks and bores for self-supply.

Most Australians expect their household water to be clean, clear and safe to drink. Ideally, it should be colourless and well aerated, with no unpalatable taste or odour, and it should contain no suspended matter, harmful chemical substances or disease-causing microorganisms.

It is vital to protect groundwater from pollution because, once contaminated, it can be very expensive and often impossible to remove the pollutant. In rural WA, the quality of a town’s water supply can be protected by proclaiming a reserve over the groundwater source recharge area (under the Country Areas Water Supply Act 1947).

Within the water reserve, the land can be managed as a priority 1, 2 or 3 source protection area. Development is generally not permitted in a priority 1 area. In a priority 2 area some development is allowed under specific conditions. For

‘With 90% of our bodies made up of water, I often feel that we are more H₂O than human.’

Anon

land in a priority 3 area, protection relies on adherence to a set of management guidelines.

Water source protection plans were completed for larger towns in the Shire of Gingin in 1997. The remaining towns in the catchment, with the exception of Miling, were completed in 1999.

From the adjacent table, it is evident that unconfined aquifers generally have a priority 1 or 2 classification. This is because shallow groundwater is vulnerable to contamination: chemicals or micro-organisms can easily filter through the soil to the watertable, particularly when the watertable is close to the surface or if the soil is sandy. In comparison, groundwater confined by soil or rock with low permeability has better protection from pollution because it is not directly connected to the surface environment.

With precautionary disinfection, the town water supplies in the Moore Catchment meet the *Australian Water Quality Guidelines for Fresh and Marine Waters (raw drinking water) 1992*. Increasing nitrate levels in the Calingiri, Guilderton, New Norcia and Woodridge groundwater supplies are a concern. Water supplies in the upper catchment are also threatened by increasing levels of salt.

	Aquifer Type	Contamination Risks	Priority
Calingiri	Unconfined	Fuel storage, agricultural activities.	2
Gingin	Confined	Minimal risk from existing agricultural and residential land uses.	3
	Unconfined	Run-off from a sports oval, rural properties and septic tanks.	3
Guilderton	Unconfined	Decommissioned tip site, agricultural activities, fuels and lubricants from limestone quarry and road run-off.	2
Lancelin	Unconfined	4-wheel drive recreation area, fuel storage, mechanical servicing facility, industrial and residential sub-divisions.	1
Moora	Confined	Minimal risks from existing agricultural land uses.	2
	Unconfined	Piggery, fuel storage and agricultural activities.	2
New Norcia	Unconfined	Agricultural activities.	2
Seabird	Confined	Minimal risks from existing residential land use.	3
Watheroo	Unconfined	Agricultural activities.	2
Woodridge	Unconfined	Septic tanks, nutrient and pesticide leachate from horticulture.	3
Yerecoin	Unconfined	Agricultural activities.	2

GETTING MOORE TO THE POINT

To ensure our health is maintained into the future we need to take steps to protect our water supplies now.

Outcome 8 – Protection

Protection is about safeguarding a valuable asset ... and discovering that water is the basis of life.

Strategy 22

Communicate the critical importance of high quality groundwater for town water supplies in order to gain government and community support for reducing and eliminating contamination risks.

Strategy 23

Develop government/industry partnerships for land uses that have the potential to adversely impact on the quality of groundwater supplies in the Moore Catchment so that best management practices can be more widely communicated and implemented.

Making a difference in Australia

Protecting our drinking water

Australians should not take the quality of their drinking water for granted, the director of the national drinking water research centre said today.

‘Most Australian expect their water to be clean, clear and safe to drink — they don’t want to pay through the nose for it either,’ said Professor Don Bursill, Director of the Cooperative Research Centre (CRC) for Water Quality and Treatment.

‘Not many people realise the enormous effort that goes into delivering high quality drinking water to towns and cities across one of the driest nations on Earth,’ he said.

The water supply industry spends up to \$1.4 billion each year to provide drinking water to Australian communities.

‘It’s important that we spend enough money to protect public health, without over-spending on systems we don’t need. To do this, we must have good scientific knowledge, relevant to Australian conditions. This is where the CRC comes in,’ said Professor Bursill.

The CRC for Water Quality and Treatment is one of the first research centres in the world to combine expertise in water quality and treatment with public health research capability.

The CRC brings together universities, CSIRO, government, water authorities and water-related businesses from across the country to focus on Australian drinking water quality.

Some research priorities

Study the relationship between water quality and gastroenteritis in the community.

Investigate best methods for identifying and controlling toxic blue-green algae.

Develop new ways of identifying and treating natural organic matter in drinking water.

Examine ways to reduce the likelihood of pathogen outbreaks in water supplies by improving understanding of how pathogens occur in water catchments and how they move through the catchment into water storage systems.

Provide a better understanding of what happens to water quality between the water treatment plant and the customer’s tap.

II. Our Development

With more and more people applying for water extraction licenses, it's getting progressively harder to fulfil growing demands for water in the lower Moore Catchment.'

Historian Joseph Powell, in his overview of water management in Western Australia between 1826 and 1998, wrote that 'whether simplistic or sophisticated, failing or succeeding, and whether emerging from the efforts of governments or private individuals and groups, at no stage were water management projects and practices divorced from the obsessive debates on the pace and character of development.'

For most of the first two hundred years of European settlement in Australia water resource policies were focused on exploitation to promote economic and demographic growth.

However, since the 1990s the environment has been recognised as a legitimate user of water. In 1994, the Council of Australian Governments (COAG) recommended a number of fundamental water reforms, including the need to provide water for the environment.

Today, the objective of water allocation is to promote efficiency and equity while protecting the environment. Allocation in the Moore Catchment is evolving along similar lines — environmental water provisions are needed to sustain aquatic and riparian ecosystems and some terrestrial vegetation systems.

Allocation is an issue for the Gingin Brook system and the Gingin

Groundwater Area. It is important to note that despite it being named the Gingin Groundwater Area, it actually extends to the Shires of Dandaragan, Victoria Plains and Moora (see map on adjacent page). The Gingin Surface Water Area was proclaimed on 2 February 1964 under the Rights in Water and Irrigation Act 1914. This proclamation was made in view of the possibility of Gingin Brook providing water to the northern portion of the Comprehensive Water Supply Scheme or to the Midland Railway line towns and districts.



The Gingin Brook is primarily a groundwater fed system. The nearest populations of three species of fish are found 250 kilometres to the south of the state.

Licensing controls on the Gingin Brook started in 1979 and by 1995 there were 19 licensees extracting surface water. From 1995 a moratorium on extraction from the Gingin Brook has been in place (at 1.6 gegalitres per year). This restriction will continue until environmental water requirements and the impact of private abstraction are better understood.

The government proclaimed the Gingin Groundwater Area eleven years after the Gingin Surface Water Area was proclaimed. Licensing began in 1988, and the number of new applications has increased rapidly in the past 13 years. This has been mainly due to an expanding horticultural industry including the growing of vegetables, fruit, grapes, olives

'Water, water everywhere but not a drop to spare.'

Anon

and paulownias.

The Gingin Groundwater Area Management Plan was produced in 1993, outlining allocation limits for 17 separate sub-areas. Because these limits did not include any provisions for the environment, the document is under review and is not expected to be completed until mid 2002.

An interim approach to managing the groundwater resources in the area has been based on the following principles:

- * Avoid over-allocating the water resource by issuing licences where there is a high degree of confidence that the allocation will not breach the limits of that aquifer.

- * Avoid any needless expenditure by licence applicants by providing early

rejection of applications where water is not available.

- * Licences will be issued or commitments made up to the interim allocation limits.

The extent to which groundwater has been allocated in the unconfined aquifers of the Gingin Groundwater Area are shown on the following page. It is important to note that there have been significant reductions in the allocation limits of the confined aquifers. New information from drilling investigations suggests that recharge of the Leederville–Parmelia and the Leederville aquifers are significantly less than originally believed due to the extent of a shale layer that lies between the confined and unconfined aquifer. The confined aquifers of the Gingin Groundwater Area are fully allocated.

An important consideration for the future is the interaction between surface water and groundwater in the catchment.

The interaction between the Moore River system and groundwater is under investigation. Preliminary results show that:

- * Saline water from the Moore River is leaching into the coastal plain aquifer south-west of Cowalla Bridge. This will lead to rising groundwater salinity in the coastal aquifer and will have an impact on coastal groundwater public water supplies and further groundwater extraction.

- * There is hydraulic conductivity between the Coonderoo River and the Perth Basin aquifers. There is potential for saline river water to drain into and contaminate the Perth Basin aquifers.

- * There is increasing demand for groundwater abstraction in the lower Moore Catchment. This raises concerns that saline groundwater may migrate from the river as a consequence of large bore abstractions.

Another interaction to consider is between the Gingin Brook system and groundwater. Preliminary investigations show that:

- * The Gingin Brook is primarily a groundwater fed system. It has been

estimated that about 80 per cent of the water discharged from the Gingin Brook is from the Greensand aquifer and the Leederville Formation.

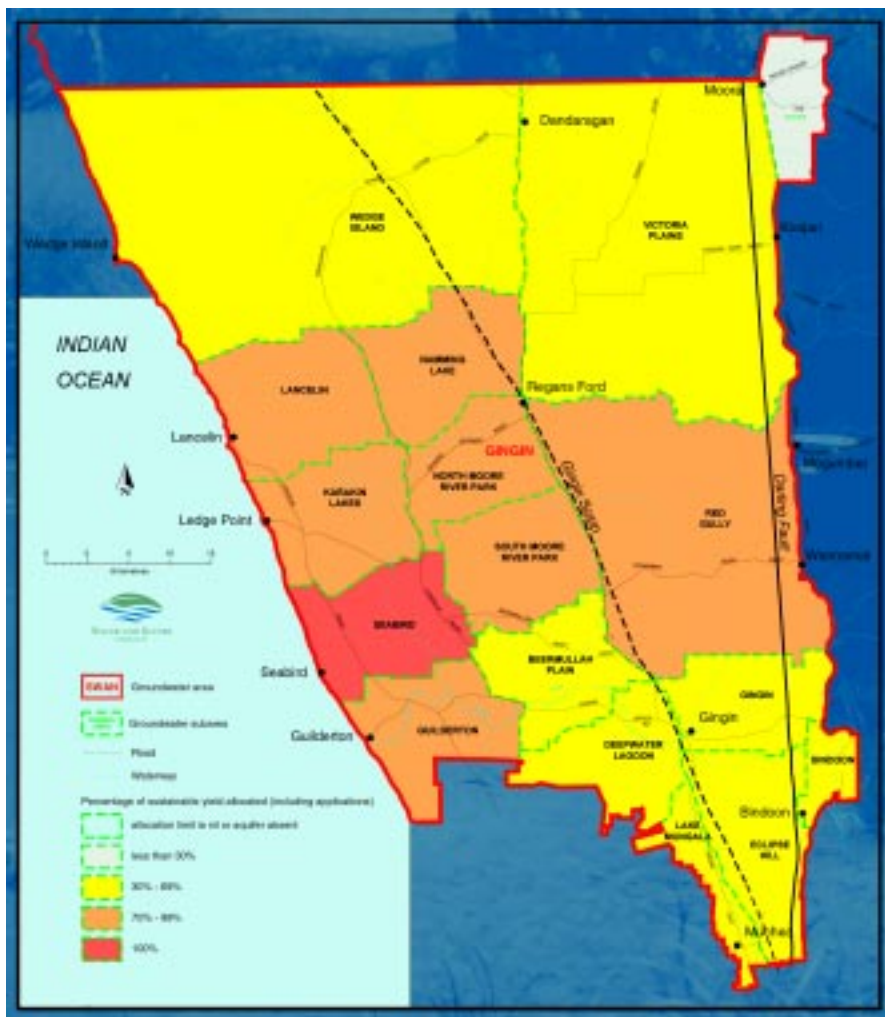
- * Bores or soaks within the unconfined Greensand aquifer and Leederville Formation may impact on stream flow when positioned too close to the Brook. Bores within the confined Leederville Formation will have a negligible impact on stream flow.

- * Nutrient levels are high in the Gingin Brook. Excess fertilisers are considered to be entering the Gingin Brook from surface run-off and groundwater flow.

The next step is to analyse and quantify all of the abovementioned risks.

Water allocation in unconfined aquifers of the Gingin Groundwater Area

(Domestic and stock bores are generally exempt from licensing)



GETTING MOORE TO THE POINT
 To improve the catchment's development potential we need to share our water wisely.

Sharing is about dividing a resource equitably ... and discovering that the environment is a legitimate user of water too.

Strategy 24

Encourage efficiency in water use through improvements to methods of agriculture and irrigation in order to increase land use options in the Moore Catchment.

Strategy 25

Determine the water requirements for environmental features in the Moore Catchment in order to refine surface and groundwater allocation limits.

Strategy 26

Establish and maintain a bore and river monitoring network in order to quantify the risk of saline water from the Moore River contaminating the coastal and Perth Basin aquifers.

Strategy 27

Position abstraction bores at a sufficient distance from waterways to prevent saline river water being drawn into the bores and to maintain the discharge of fresh groundwater into the waterway.

Making a difference in Western Australia

Protection policy for WA environment

The setting aside of water for the Western Australian environment has been formally recognised for the first time in a new Statewide policy.

The Environmental Water Provisions Policy for Western Australia — developed by the Water and Rivers Commission — outlines how the Commission determines what water can be used for development and social uses after environmental needs are met.

Commission chief executive Roger Payne said that the new policy was good news for both the environment and for the certainty of the State's future sustainable development.

'A recent audit of water use in WA found that usage had doubled in the last 15 years and is projected to double again by 2020,' Mr Payne said.

'However it is clear from this audit that water is sustainably managed in WA.

'This increasing use highlights the need

for water allocation to be carefully managed in the coming years to meet future demands while maintaining the State's environment.

'When allocating the right to use water, whether it be for mining, irrigation or town water supply, this policy outlines that the needs of the environment are determined early in any water allocation strategy.

'This process is based on getting it right the first time, thereby preventing situations that have arisen in eastern States where water has had to be taken back from farmers and industry to replenish the depleted environment.

'Economic, social and ecological considerations are all important and all need to be considered in water allocation decision-making, consistent with the objectives of the National Strategy for Ecologically Sustainable Development.'

The Water and Rivers Commission balances these needs for water in

allocation planning throughout the State on regional, sub-regional and local area levels.

Extensive water allocation planning is now underway in the Kimberley, Pilbara, Midwest and South West regions. The new policy will be instrumental in ensuring that adequate water will be set aside for the environment in this process.

Environmental Water Provisions (EWPs) are the water levels provided to maintain the ecological values of water-dependent ecosystems, taking into account ecological, social and economic impacts.

The draft policy was one of a series of Water Reform discussion papers released for public comment during consultation on the Rights in Water and Irrigation Amendment Bill 1999 that modernised WA's water laws.

More information on the Environmental Water Provisions Policy for Western Australia is available from the Water and Rivers Commission on (08) 9278 0300.

Extract from a government media release, 22 March 2001

We are linked to the floodplain through our sense of security

I. Our Security

‘I’ll never forget flying over Moora after the floods. It was a clear morning and the ground looked like a mirror for the sky. There was water everywhere.’

Between 18 and 20 March 1999, heavy rainfall associated with the remnants of tropical cyclone Elaine fell over the Moore Catchment. The result in Moora was the highest flood on record, causing massive damage and disruption to the town. And that wasn’t the first or last time the town of Moora had its feet wet. Historical records indicate that there were major floods in 1917, 1955, 1963 and 1968. After the March 1999 floods, Moora was flooded again in May and August.

So why build in a town in a floodplain? Many rural towns in the south-west are located next to rail networks. At this time railways were constructed in the lowest parts of the landscape with the least gradient. The Midland Railway line is no exception, following the valley of the Moore and Coonderoo rivers.

Flooding in the Moore River Catchment is not limited to Moora. The March 1999 flood caused extensive damage to infrastructure, crops and livestock throughout the Moore Catchment.

Indeed, the rain in May and throughout

winter caused extensive flooding and long-term inundation to many low lying areas from Latham to Gillingara. Roads were closed to the east and west of Marchagee for almost 6 months.

Major flood events and consequent flood damage happen infrequently in the Moore Catchment, but the costs at the time are often very high.

But how significant is the cost when it is evened out across time?

To work this out, the average annual damage is calculated. This incorporates the relative probability and damage over all possible flood events from a two year event to the probable maximum event. Under existing conditions, the estimated average annual flood damage for Moora is at least \$105,400.

Is this an economic cost the community can bear year in, year out?

If the answer is no, then we need to seriously weigh up the benefits and cost of various management options. While one option is to re-establish the entire town outside the floodplain, it is not considered feasible for economic and social reasons.

Therefore, people must live with floods by managing the floodplain. When

managing the floodplain there are three problems that need to be addressed:

- i) Existing problem — existing properties which are liable to flooding.
- ii) Future problem — properties which, due to development, become liable to flooding and which were not part of the existing problem.
- iii) Residual problem — flooding that is unavoidable after the adopted floodplain management measures have been put in place.

For Moora, a detailed floodplain management study was undertaken after the 1999 floods. The problems outlined above were addressed using options such as emergency response, planning and structural works (see table below).

Emergency Response

While the response to the March 1999 flood was handled very well by the Shire of Moora and the State Emergency Service many lessons were learnt in flood forecasting, warning and evacuation.

For the May 1999 floods a local warning network had been put in place and the town was well prepared for the emergency. River levels are now constantly monitored by the Water and Rivers Commission via a computer link-up with gauging stations located in the catchment.

‘Most of the people we told said that they would leave. Others, especially one 90-year-old lady said, “I don’t know what all the fuss is about. After 90 years in this town the water never came near my house!”’
Dave Van Heek, State Emergency Service

	Residual Problem	Future Problem	Existing Problem
Management measures	Emergency response	Planning mechanisms	Structural works
Options	Forecasting, warning, evacuation, recovery, ongoing community education.	Land use zoning controls, building regulations, info. on appropriate building materials.	Retention basins, levees, channel widening, flood-proofing of buildings, house raising.
Cost	Low	Low	High

Source: Water Studies Pty Ltd (2000)

Planning Mechanisms

The Moora Shire Council has adopted the following zoning and building controls as part of best practice development within a floodplain:

- Future residential, commercial, industrial and public utility development be encouraged in flood-free areas.
- Subdivisions below 2000 square metres can occur subject to any buildings being constructed using high base foundations (stumps).
- Independent hydraulic assessments be conducted for proposed developments in high flood ways.
- Finish floor levels for houses be 0.5 metres above the March 1999 flood level.
- For non-habitable buildings finish floor levels be 0.15 metres above the March 1999 flood level.

Structural Works

Due to the anxiety and stress related to major flood events, the community understandably wants solutions to

existing problems as soon as possible. Unfortunately, structural measures tend to be costly and the options are often complex. In any catchment, a thorough investigation would be necessary before any major works were implemented on the ground.

A number of options have been evaluated on economic, social and environmental grounds for Moora, including detention basins, levee bank systems and widening the river channel. The Shire of Moora has applied for funds to do a detailed assessment of the Long Pool Detention Basin option.

The federal government provides financial assistance for flood mitigation measures that protect existing developments. However, with the cost of flooding averaging \$400 million a year across Australia, funding would normally cover less than 30 per cent of the cost of design and construction of approved works.

Other cost-sharing arrangements need to be negotiated to ensure that an equitable distribution of the costs is achieved.

These lakes will play an increasing role in flood mitigation because the proportion of the catchment wetted-up will increase as groundwater levels rise. A recent study showed that on a similar catchment, flood flows could be up to twice as great once groundwater levels have stabilised in 50 years time.

Surface water management practices, such as grade banks, will reduce the impacts of flooding locally. They reduce the velocity of run-off and therefore minimise paddock erosion. For Moora, it will mean reducing the impact of flood events with a two to 10 year recurrence interval. For larger events like March 1999, structural works are required.

Drainage works in the catchment have the potential to increase the impact of flooding if they are designed incorrectly.



Hydrologist Peter Muirden, showing the height of water in the Yarra Yarra Lakes after the winter of 1999, and the level of water that would have overtopped the lakes.

Whole system management

An essential aspect of understanding flooding is identifying the links between the different components of the hydrological system.

To the north of Moora there are many lakes which have the potential to attenuate flooding. The Yarra Yarra lakes system has a large capacity to store flood waters, holding approximately 200 gigalitres before it overflows. In the large rainfall events of 1999 it did not overflow, and even if it should do, the flow rates would be very small and the salinity concentration would be similar to those downstream. Similarly, the lakes along the Coonderoo River store water and therefore mitigate flooding downstream at Moora.

GETTING MOORE TO THE POINT

To improve our sense of security we need to mitigate the existing and future problems associated with major floods.

Outcome 10 – Mitigation

Mitigation is about taking precautionary actions ... and acknowledging that floodplains will always be subject to flooding.

Strategy 28

Maintain an effective flood forecasting system in the catchment in order to give people living in flood prone areas adequate time to initiate emergency procedures.

Strategy 29

Maintain agency and public awareness of flood warning and emergency responses in order to overcome complacency and the problems associated with the turnover of staff and residents in flood prone areas.

Strategy 30

Utilise land use planning and advisory tools to encourage development outside the 1 in 100 year flood level of the entire Moore River and its tributaries in order to decrease the potential for future flood damage in all parts of the catchment.

Strategy 31

Explore avenues for funding flood mitigation works in order to share the costs equitably and reduce existing anxiety and future social disruption to the community.

Making a difference in the Moore Catchment**FUNDING ALLOCATED TO FARMERS IN THE UPPER MOORE CATCHMENT**

A sum of \$130,000 has been allocated to farmers in the upper Moore River catchment between Moora and Dalwallinu as part of a Natural Heritage Trust (NHT) funded project to improve surface water management.

NHT Project Coordinator, Jason Carter, said the aim of the funding is to demonstrate and encourage better land management practices in the Moore River catchment.

'The funding will be used to subsidise more than 100 kilometres of grade banks, over 100 kilometres of fencing for watercourses, remnant vegetation and cleared areas to be revegetated, and 100,000 seedlings to be planted in July

2001,' he said.

Mr Carter said the funding of the on-ground activities is the first stage of implementing local action plans that have been prepared.

'The local action plans are aimed at ensuring the long term sustainability of both economic and environmental values,' Mr Carter said.

'Undertaking these and further similar works will contribute to controlling runoff from the catchment and assist with reducing the flood risk to Moora,' he said.

The on-ground works have already started with the first 2.5 kilometres of fencing completed by farmer Frank King of Bindi Bindi. Mr King said the fencing is protecting a creek

line and an area of remnant vegetation.

Mr Carter said the response from landholders in the catchment has been great.

'Requests for funding grants have exceeded the project's ability to fund all work this year but the Moore Catchment Group is currently looking at options to gain further funding to undertake more on-ground works,' he said.



Landcare technician Noel Dodd and farmer Mike McLean survey the first of over 100 kilometres of grade banks to be constructed.

I. Our Pathway

‘When I walk along the Moore River I pretend I’m in the exploration party of George Fletcher Moore. His words ring loudly in my mind ... ‘the scene of the river was ever varying and kept the interest alive’.

In places the river hasn’t changed a great deal from George Fletcher Moore’s original observations in 1836. For instance the ‘good alluvial flats with abundant grass’ remain a feature of the Swan Coastal Plain and Dandaragan Plateau. In addition, the deep river valley and ironstone hills between Mogumber and Regans Ford are still visually impressive.

In others places the river has changed. The deep pools described favourably by early explorers and pastoralists are now mostly filled with sediment. Bank erosion is severe and extensive on the Moore River.

William de Burgh is a local historian whose family has farmed on the Moore River since 1858. He remembers how the 1917 flood caused significant erosion on cleared land and the banks of the Moore River. Near the Cowalla homestead (where the Moore River bends south on the coastal plain), sediment was deposited in heavy layers in the flats and filled at least one pool, known as Mandigin Pool. De Burgh recalls subsequent floods cutting new river courses and filling pools and particular channels with sediment.

The extent of erosion and the enormous quantity of sediment on the move suggests that the old drainage line of the river may no longer be large enough or strong enough to contain the energy of floodwaters.

There are a number of practical reasons for this. A greater volume of water is flowing off the catchment due to clearing, increasing the head of water along the river during floods. There is also a reduction in the dissipation of the energy of floodwaters due to less fringing vegetation along the river. Added to this is the prevention of water dispersal over the floodplains by levee banks, which further increases the energy of the floodwaters.

River rehabilitation is not simply a reversal of the degradation process. Given the changed conditions under which the river system now operates, it is very unlikely that the original state of the river could be re-established.

Over \$100 million is spent annually in Australia to address stream degradation, but project failure rates are high. This is because efforts have generally been focused on reaches that show no signs of natural recovery.

The most effective strategies for river rehabilitation should be viewed as a process of recovery enhancement. That is, river reaches already showing natural signs of recovery (e.g. a well-defined low flow channel) will yield the most cost-effective, sustainable returns.

Prioritising river reaches according to their recovery potential offers a great opportunity for farmers, catchment management committees and government agencies to target their resources (see following page).

Enhancing the physical stability of the Moore River and its tributaries may also encourage the community to restore its cultural heritage.

The Moore River contains many reminders of indigenous connections and early European settlement. These should be enhanced on the grounds that they are

‘When you put your hand in a flowing stream, you touch the last of what has gone before and the first of what is yet to come.’
Leonardo da Vinci, philosopher

our link to the past, and losing our past makes it more difficult to evaluate our future.

Cultural features that could be highlighted include:

- River pools and reaches significant to Aboriginal people.
- Places where the Perth to Dongara Stock Route crosses the Moore River, especially at Neergabby where the Drover’s Inn (Junction Hotel) still stands.
- The role of the Moore River in the operation of steam locomotives on the Midland Railway Line.
- Significant relicts such as bridges. For instance, the old Junction Bridge over Gingin Brook has the oldest surviving timber bridge piers known in WA.
- Historic and contemporary stories of life on the river.

GETTING MOORE TO THE POINT

To improve the pathway of water we need to take practical measures to recover the physical and cultural integrity of the catchment’s waterways.

River Types



Intact reaches need protection from off-site impacts. These should be the highest priority in the catchment.

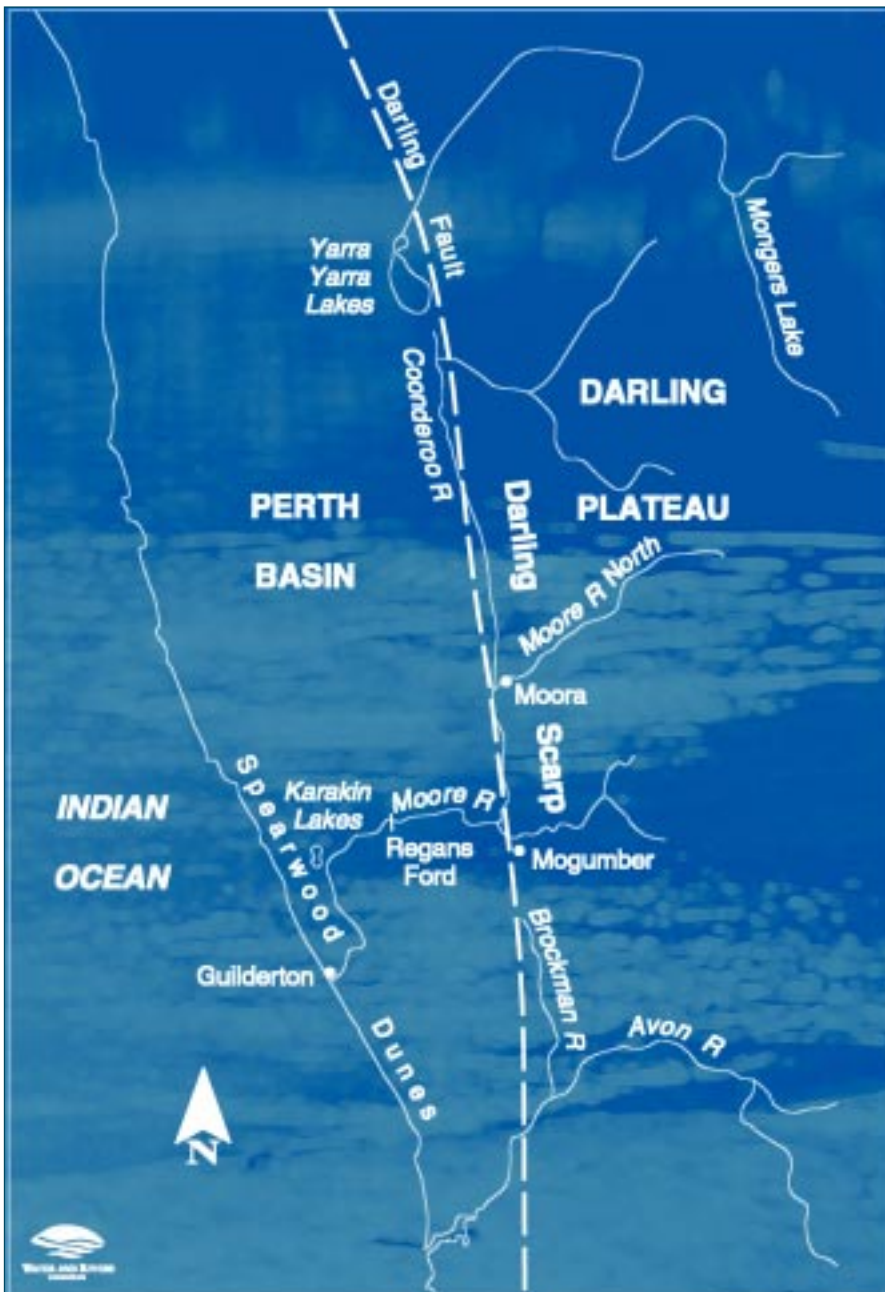
Strategies for reaches showing high recovery potential include vegetation maintenance and stock management. Strategies for reaches showing moderate recovery potential include direct planting, bed and bank control structures.



Degraded reaches can be left to adjust naturally until they show signs of recovery.

If we had a time machine ...

The Moore River has a strange course which twists and turns unlike more conventional rivers. This is because of a complex history – what we see now as the Moore River is really parts of several rivers joined together.



Originally, it seems, westward drainage from the Darling Plateau was prevented from flowing directly to the coast by uplift of the Perth Basin. Instead water flowed down the valley that ran south from what is now the Yarra Yarra Lakes along the Darling Scarp, turning south-east to cut the valley now occupied by the Brockman River, and finally into the Avon River. The part of the valley occupied by the Coonderoo River, and probably the Moore River as far as south as Mogumber, was filled with up to 30 metres of sediments between two and five million years ago.

At some stage, a stream may have cut back from Regans Ford (this was the coastline about 2 million years ago) and captured the Moore River at Mogumber — making it do a right turn. Alternatively, the river may have found its course blocked to the south, and overflowed to the west, cutting the gorge from Mogumber to Regans Ford.

With the onset of drier conditions, and recession of the coast during the ice ages maybe 100,000 years ago, the Spearwood Dunes built up along the coast, preventing the river reaching the sea. The river then had to turn southwards from Karakin Lakes before breaking through the sea at Guilderton.

Outcome 11 — Recovery

Recovery is about making something work properly ... and discovering that nature has its own set of checks and balances.

Strategy 32

Prioritise the Moore River and its tributaries into sections of intact, recovering or degraded reaches in order to help river managers prioritise and cost out river rehabilitation efforts.

Strategy 33

Explore avenues for providing landowners with funding assistance for river and tributary rehabilitation so that works can be designed and implemented within a catchment framework.

Strategy 34

Recognise and promote the traditional, historic and contemporary associations that the community has with the Moore River and its tributaries in order to foster a caretaker ethic towards the region's waterways.

Making a difference in the Moore Catchment**Cultural values protected**

An eight kilometre section of the Moore River, downstream of Mogumber, has been fenced off to help prevent erosion of the riverbank — but also with a view of preserving an area of significance to Aboriginal people.

Many of the State's rivers and streams have ties with Aboriginal communities because they were important places for gathering food and sites of cultural and spiritual significance.

But the section of river near Mogumber is special for another reason — it's the site of the old Mogumber Aboriginal Mission which operated from the early 1900s.

Aboriginal people from around the State were sent to the mission — with some dying there without having the opportunity to return to their families and homes. The old mission is now an Aboriginal farm, owned and run by the Wheatbelt Aboriginal Corporation.

Like many other farms the property was in a difficult situation: the managers were required to get the farm more productive to be commercially viable, whilst at the same time the owners wanted to retain its cultural links and attract tourists to this stunning stretch of river.

So with the help of the Water and Rivers Commission, the Wheatbelt Aboriginal Corporation has been working to try to protect the riverine environment. This was achieved by erecting a fence along the foreshore to stop stock



An impressive view of the Moore River winding through the Mogumber farm.

trampling the riparian vegetation.

The Water and Rivers Commission provided the material for the fencing, which was erected and will be maintained by the farm community.

II. Our Playground

‘The waterways of the Moore Catchment are a treasure chest of recreational experiences, and it’s not just because there is a ‘Silver’ Creek or a ‘Diamond’ Island.’

Recreation is defined as an agreeable or refreshing activity, relaxation or amusement. In Western Australia, waterways are a valuable recreational resource.

The Moore River estuary is a popular recreation site in the catchment. Local resident Sylvia Cleverly captures its

*There’s a river somewhere just north of Perth,
That’s a foretaste of Paradise here on God’s earth.
There’s a desert, bush, river, ocean and trees,
Where children are safe to go where they please.
They can fish, canoe, swim or skim down a dune,
Then later, watch stars and the bright rising moon.*

relaxed atmosphere in a poem: The results of a survey conducted at Guilderton in 1998 have shed some light on how people use the Moore River estuary for recreation.

The Moore River estuary is a recreational resource utilised by people of all ages. It is most popular among family groups and people living in the northern suburbs of Perth. One would expect this trend to continue with the metropolitan area expanding northwards.

The popularity of the Moore River estuary is increasing, with a large number of first-time visitors to the area. Upgrades to roads and the proposal for a new road linking Lancelin to the Cervantes–Jurien

Bay area will no doubt further increase the number of visitors to the estuary. Fishing, swimming and viewing the scenery are the most popular recreational activities on the Moore River estuary. Therefore, any act that has a negative impact on water quality or destroys the natural surroundings will have an adverse affect on the popularity of the area.

Primary and secondary contact with water is a significant public health issue. In general terms, the water should be sufficiently free from direct contamination by human and animal faecal material, nuisance organisms and toxic chemicals.

Micro-organisms

Stock have direct access to a large proportion of the river foreshore and septic tanks are used along the Moore River and Gingin Brook. The Shire of Gingin has been routinely measuring bacterial counts in the estuary since 1999. The shire has erected a sign that says ‘swim at your

own risk’ and vacation swimming lessons are no longer held in the Moore River estuary.

Landholders are being encouraged by Landcare groups to fence off the Moore River and its tributaries. Grants are available to subsidise the cost of erecting the fence.

Nuisance organisms

Algae are a diverse group of aquatic plants containing photosynthetic pigments. Many are microscopic but some can be large, including the large seaweeds. Without algae our waterways would be deprived of oxygen and food, and would support few life forms.

**‘I chatter, chatter as I flow
To join the brimming river,
For men may come and men
may go,
But I go on for ever.’**
Tennyson, from the poem The Brook

Algal blooms — the rapid excessive growth of algae — are a public health concern and an ecological problem. They are generally caused by high nutrient levels and favourable conditions such as warm weather and still water.

During the summer months, algal mats (usually *Enteromorpha* species) are commonly observed in the Moore River estuary. This is a concern as it indicates a nutrient-rich system. Furthermore, when the mats decompose they deplete the water of oxygen, which can lead to the death of aquatic plants and animals. Algal species that can cause toxic algal blooms have been detected in the estuary, but to date only in low concentrations.

With two years of water chemistry data, researchers have found that during summer total nitrogen loads from the Moore River and Gingin Brook are similar. In comparison, total phosphorus loads are



The W festival was an opportunity for local children to learn about the environment whilst developing their artistic skills.

much higher from the Gingin Brook. During winter total loads of nitrogen and phosphorus are much higher from the Moore River due to the volume of flow. Efforts to reduce nutrient losses should be a high priority in both catchments.

Research has shown that vegetated buffers 10 to 50 metres wide can achieve phosphorus and nitrogen filtration rates of the order of 50–100 per cent.

In this area, the Shire of Gingin has taken a proactive approach with its Irrigated Horticulture Standards (Policy Statement No 1.12). It states that all annual horticultural activity shall have a minimum distance of 200 metres from any wetland. Any included within this minimum distance shall have a dense native vegetation buffer of not less than 20 metres in width. This buffer is to be established prior to the commencement of the development and maintained for the duration of the development. For perennial horticulture, the set-back is reduced to 100 metres and the buffer is reduced to 10 metres.

Further research is needed in the catchment to determine the appropriate setbacks and buffers for different land uses. Best land management practices should also be implemented, encouraging soil conservation and discouraging excess application of fertilisers that eventually find their way into waterways. According to calculations by CSIRO, \$900 million is outlaid each year on fertilisers, accounting for 23 per cent of total production costs. However, it has a net efficiency of 10 per cent.

Toxic chemicals

Waterways containing chemicals that are either toxic or irritating to the skin or mucous membranes are unsuitable for recreation. To date, there have been no investigations on the presence and concentrations of toxic chemicals in the Moore River or its tributaries.

Visual use

Preserving the visual amenity of the landscape surrounding the Moore River estuary will be a tough challenge. Australians love the coast, and in Western Australia the number of people living on



The rest area at the Lancelin Road Bridge is a popular waterway location in the catchment. So too is the Neergabby Junction, granville Park, Apex Park and Regans Ford picnic area.

Generally these locations are stopping and resting places, where people have minimal primary or secondary contact with the water body. Enhancing the visual appeal of these natural assets would be received favourably by the local community. Information from a Moora District Community Meeting in February 2000, indicates that beautifying the Moore River is one of the top ten items that the community wants to do.

the coast bordering the metropolitan area has climbed by 600 per cent between 1971 and 1990.

The extent of development on the foreshore is presently small. However, the fear is that environmental damage is usually caused by an incremental process.

This has been described as the tyranny of small decisions. Therefore, it is appropriate to establish sound planning policies and management practices as soon as possible to mitigate against this problem.

GETTING MOORE TO THE POINT

To improve our watery playgrounds we need to enhance their natural values and buffer them from adverse land use impacts.

Enhancement is about improving the quality of an asset ... and discovering that our enjoyment of waterways hinges on them being healthy.

Strategy 35

Promote the natural beauty and ecological functions of the various waterways in the catchment so that people see waterways as more than just a drain or channel.

Strategy 36

Support and expand the existing water quality monitoring program in order to establish targets and incentives to reduce nutrient losses from specific sub-catchments.

Strategy 37

Demonstrate and promote how different land uses positively and negatively impact on the region's waterways so that sensitive land use planning and management are central to future decisions.

Strategy 38

Redesign existing recreational sites and facilities so that they protect the local environment and at the same time improve the social and economic potential of waterways in the region.

Making a difference in the Moore Catchment

Guilderton Green Corps project launched

Federal Member for Pearce Judi Moylan officially launched the Lower Moore River Green Corps project in Guilderton.

Ten young people will take part in the project, which will address environmental issues recognised in the Lower Moore River Action Plan.

Speaking at the launch Mrs Moylan said the participants would spend six months working to reverse damage done to the local environment and protect it from further damage.

'Among the problems this project will address is the damage caused to the banks by heavy use and

the effects of introduced species,' she said.

'The participants will take part in activities including planting, seed collection, fencing, bank stabilisation and propagation.'

Mrs Moylan said the program, as well as providing tangible environmental benefits for the Lower Moore River, would also provide the 10 young people taking part with practical experience and accredited training.

'It is this combination of environmental and

skill based outcomes that has led to Green Corps nation wide success,' she said.



Green Corps hard at work on the banks of the Moore River.

We are linked to the ocean through our own backyards.

1. Our Backyard

'I was really surprised to find that not everyone living in the Moore Catchment had been to the mouth of the river at some time, nor felt a connection to where their run-off and groundwater ultimately ended up.'

Does that really matter?

Yes, it does. About 80 per cent of contamination in marine environments is thought to enter the sea from the land. In catchments dominated by agricultural land uses, the main contaminants are nutrients and sediment.

But is that a concern to us?

Some people may view the ocean as a huge receiving environment. By virtue of its size, the ocean should easily assimilate increased inputs of nutrients and sediment. This is certainly not the case for the central coast region of WA.

Our coastal waters are naturally nutrient poor due to historically low riverine inputs and the absence of a significant

up-welling of nutrient rich waters from the deeper ocean.

In this type of environment, low concentrations of dissolved inorganic nitrogen limit biological productivity. As a consequence, our waters are characterised by low counts of phytoplankton and high water clarity. Productivity is instead driven by plant communities attached to the sea floor. These typically consist of extensive macroalgal communities and perennial seagrass meadows.

These biological communities can absorb occasional high fluxes in nutrients, but prolonged inputs can cause significant imbalances. Nutrient enrichment stimulates phytoplankton blooms which cloud the water and promote excessive growth of 'nuisance' algae.

Another natural characteristic of the central coast region is the low level of sediment input to the near-shore waters. Elevated sediment loads can have a detrimental impact on marine communities by smothering sedentary plants and animals, clogging gills, reducing the light available to plants for



photosynthesis and altering sediment grain size on the seabed.

To date there has not been any monitoring of water and sediment quality, nor marine ecosystem health near the mouth of the Moore River.

At a more fundamental level, there needs to be an understanding of the mixing of catchment and ocean waters to determine the degree and spatial extent to which the Moore Catchment influences the marine environment. This is an important consideration for marine biodiversity conservation in the region.



A plume of brown water can be seen entering the Indian Ocean from the Moore River. Picture taken following floods in the catchment in March 1999.

GETTING MOORE TO THE POINT

To better manage the connection between people and the ocean we need to **investigate** how our actions are impacting on the marine environment.

Investigation is about carefully studying a system ... and discovering that the ocean does have a disturbance threshold.

Strategy 39

Collaborate with research institutions to assess the state of the marine environment offshore from the Moore River Estuary so that a benchmark exists for monitoring change.

Strategy 40

Address any land-sourced pollution problems on a catchment basis in order to communicate best land and water management practices and develop consistent performance targets for industry, the community and government authorities.

Strategy 41

Take responsibility for improving the quality of stormwater running off the catchment after large rainfall events in order to reduce the flush of nutrients and sediments to the marine environment.

Making a difference in Western Australia

Western Australia now ‘The Ocean State’

It's been dubbed The Wildflower State, the Cinderella State and the State of Excitement. Now Western Australia is set to win a new title as the ‘Ocean State’, according to one of the nation's top marine scientists.

The identity is mainly thanks to WA's fast growing investment in marine research, management and policy, the Chief of CSIRO Marine Research, Dr Nan Bray, told State parliamentarians.

Speaking at a science briefing for MPs in Parliament House, Perth, Dr Bray said



A survey of community attitudes showed that recreational fishing is a popular activity in the estuarine and marine environments of the Moore Catchment.

that given the huge size of Australia's ocean territory and the fact that it supports industries worth \$50 billion, national investment in marine research was disproportionate.

‘Too often we ignore the great potential of our oceans. They can, if we learn to understand them and use them well, provide us with great and lasting gifts.

‘The oceans drive the weather on our planet. They provide a great reservoir for the greenhouse gases we are pumping into the climate system.

‘In Australia today, earnings from marine resources are growing at three or four times the rate of the national economy,’ Dr Bray says.

In the past three years, WA in particular has taken rapid steps to invest in understanding and managing its oceans through a series of scientific policy initiatives. These included a taskforce aimed at identifying the State's marine research needs and establishing the best ways of applying both for funding and facilities to those needs.

This has led to the establishment of the Strategic Research Fund for the Marine Environment for strategic research in areas such as broad-scale oceanography, coastal and shelf processes, marine habitat mapping, ecosystem monitoring and planning tools for ecologically sustainable development.

The fund is a \$20 million joint venture between various state agencies, universities, industry and CSIRO Marine Research aimed at studies of the State's marine resources and how to address them in a sustainable way.

‘I think it's a great model. As usual, WA is leading the way — and it is because the State took the lead in setting priorities. That helped our working group to find a mechanism for joint work, confident we could meet its needs on an ongoing basis.’

Dr Bray says the research may lead to new understanding of how ocean systems affect the State's marine industries and agriculture, new information on marine biodiversity and ecosystems and better ways to manage and regulate ocean resources.

Extract from CSIRO's media release on marine research, 16 November 2000.

We are linked to native plants and animals through our senses and identity.

I. Our Senses

Wouldn't it be grand hiring Noah's ark for a day or two. It certainly would be a great chance to meet all the creatures that live in the Moore Catchment.'

There are very few people who do not take pleasure in seeing a blue wren in their garden or a joey taking its first wobbly hops.

Biodiversity can be a source of profound inspiration. Take the poetry of Banjo Patterson or the gumnut babies of May Gibbs as an example.

A turtle made of of natural fibres was a feature of the Guilderton Art Trail.



Not for you? Well ... as a younger person surely you would have had lots of fun swimming in a local creek, catching tadpoles, almost standing on a bobtail, climbing trees and smelling the wattles in flower.

Playing in the bush is of tremendous educational value to our youth. More formally it can be used at all levels of education, whether it be primary, secondary, tertiary or adult education. It can facilitate the study of biology, geography, geology and history.

But you still don't like the idea of an outdoor classroom? Well ... catching a feed of fish off the Guilderton coast, taking them home and cooking them on the BBQ would have to make your mouth water!

There are so many ways to enjoy our natural biodiversity: bushwalking, picnicking, bird watching, painting, photography, fishing, plant identification — the list goes on.

Biodiversity yields indirect values too. These are usually described as ecosystem services. In an agricultural context, biodiversity is essential for controlling pests and diseases, pollinating crops and forming soil.

The future use of biodiversity also has a value — it is described as an option or bequest value. Natural compounds for medicine usually fall into this category.

An environment rich in biological diversity offers the broadest array of options for sustainable economic activity, and for adapting to changing environments.

This applies to agriculture too.

Of the 200,000 species of wild plants, notes biogeographer Jared Diamond, 'only a few thousand are eaten by humans, and just a few hundred of those have been more or less domesticated.' Three quarters of the world's food comes from only seven crop species — wheat, rice, corn, potatoes, barley, cassava (manioc) and sorghum.

Disease already damages or destroys 13 per cent of the world's crops, insects 15 per cent and weeds 12 per cent; in all, two-fifths of the world's harvest is lost in the paddock.

As already noted, the Australian environment is not naturally suited to supporting the exotic plants and animals that provide the bulk of our produce. The most urgent and challenging task in front of us is to develop systems and cultivars for sustainable agriculture.

'What does it matter if we lose a few birds, even half of them? One answer is our lives will be poorer and our landscapes will be aesthetically impoverished and harsher to live in.'

Denis Saunders, CSIRO

According to Uriel Safriel, director of the Blaustein Institute for Desert Research (who gave a presentation at the Moore Catchment Group's community forum in 2000) the initial challenge of diversification should not be taken by the farmers themselves as this requires an institutional investment in research and development in the agricultural and economic disciplines. Once the agricultural know-how and economic guidance are available the result hinges on the farmers' open-mindedness, courage and determination.

Biodiversity offers an alternative livelihood for a farmer. For example, income can be supplemented with ecotourism (based on the non-cleared portions of the farm), aquaculture and silviculture.

GETTING MOORE TO THE POINT

To better manage the connection between people and the biota we need greater investment in our natural biota.

Investment is about backing a project ... and discovering that biodiversity is the future bread and butter of the catchment.

Strategy 42

Provide opportunities for people to learn and enjoy their natural surroundings to build an understanding of the intrinsic values of biodiversity.

Strategy 43

Communicate that biodiversity losses in soil microorganisms, pollinators and other species are counter-productive to enhancing agricultural productivity so that efforts are directed towards mimicking and preserving ecological functions in the landscape.

Strategy 44

Balance the exploitation and preservation of biological resources in the Moore Catchment to ensure that options for the future are not compromised.

Strategy 45

Support local projects developing the commercial potential of our biodiversity in order to harness the catchment's intellectual property and increase returns to the community.

Making a difference in the Moore Catchment

Bouquets for wildflower lady

Coomberdale wildflower entrepreneur Rhonda Tonkin has won the Western Australian Rural Industries Research and Development Corporation Rural Women's Award for 2001.

Always modest about her exceptional achievements, Mrs Tonkin said she was honoured to receive her award.

'I am amazed at the number of people who have called to congratulate me,' she said.

'Family members, friends, past employees, truck drivers and business acquaintances have taken the time to call me,' she said

Mrs Tonkin is the principal of Western Wildflower Farm situated in Coomberdale in the Shire of Moora.

The operation involves producing, value-adding, wholesaling, retailing and exporting wildflowers from the property and around the region.

In presenting the award, Chair of the Rural, Remote and Regional Women's Network Liz Guidera paid tribute to Mrs Tonkin's contribution to the wildflower industry and her local community.

'Rhonda has been personally committed to sustainable agriculture and the wildflower industry for over 25 years, as she has built her business into a sophisticated operation it is

today,' Ms Guidera said.

'She has been a tireless worker and a generous mentor, making her an outstanding role model for rural women and all Australians,' she said.

Mrs Tonkin has a vision to enhance the sustainability and export value of the industry.

She believes this can be done by broadening the economic base through improve flora resource management and tourism.

'I believe that generating stable export markets will provide for economic sustainability, which will create greater opportunities for rural women and diversification opportunities,' Mrs Tonkin said.

Already Mrs Tonkin said she has received many calls from rural women who are working from home in a similar way and have expressed an interest in working with her.

Along with her award Mrs Tonkin will receive a \$20,000 bursary which she intends to use to undertake a three week market research study of the US and Europe to improve market relationships and expand the market for Western Australian flowers.

In March Mrs Tonkin will travel to Canberra where, along with all State and Territory winners, she will be presented with her bursary at a national awards dinner and take part in a leadership seminar and media training.



Extract from The Central Midlands and Coastal Advocate, 21 February 2001.

II. Our Identity

'It's unlikely that future generations will forgive further losses of biodiversity through bad management or lack of commitment.'

In today's society there is a growing view that all species have an inherent right to exist. Biodiversity belongs to the future as well as the present and no generation of people has exclusive rights to it

This is not a new concept. Many religions promote preservation of all living things. For instance an Islamic biblical passage reads: 'And the almighty God said: There is not an animal on the earth, nor a bird on the wing which is not part of your community.'

As a result of the evolutionary process, Australia's flora and fauna are distinct in many ways from those found elsewhere. Long isolation has led to the evolution of endemic species (plants and animals restricted to a specified region or locality) and its stability has allowed the survival of many ancient and relict species.

Australia's climate and landscape variability have also led to the development of biota with many adaptations to local conditions — and these species have interacted in specialised ways to form diverse communities.

Human activity has been changing Australian ecosystems for at least 50,000 years, but the pace and extent of change has increased since European settlement. In February 2000, the scientific journal *Nature* named Western Australia's south-west as one of 25 global hot spots, singled out for its internationally significant biodiversity and the extinction threat posed to it.

According to the Western Australian State of the Environment Report for 1998,

the greatest number of extinctions has occurred in the wheatbelt region. Threats to biodiversity in the wheatbelt are from multiple disturbance factors including:

Clearing and fragmentation of habitat

The destruction of habitat is the major cause of biodiversity loss across the globe. According to American Professor, Paul Ehrlich, 'the primary cause of the decay of organic diversity is not from direct human exploitation or malevolence, but the habitat destruction that inevitably results from the expansion of human populations and human activities.'

In the Moore Catchment, land clearing has been principally for agricultural development. In 1997, a Memorandum of Understanding to protect remnant vegetation on private land was signed by the Commissioner for Soil and Land Conservation and the state government agencies for natural resource management. Clearing is still an issue, particularly for horticultural development on the Swan Coastal Plain.

Information from the Department of Conservation and Land Management indicates that the Shires of Perenjori, Moora, Victoria Plains, and Dalwallinu have less than 10 per cent remnant vegetation. The Shires of Dandaragan, Coorow and Carnamah have less than 25 per cent, but this is largely concentrated in the western parts of the Shires which are outside the Moore Catchment. The Shire of Gingin has less than 30 per cent remnant vegetation.

Remnant stands are scattered throughout the Moore Catchment in various sizes, shapes and degrees of isolation. Presently, no geographical analysis has been carried out to determine their size distribution, patchiness and connectivity. Geographical analysis in the Avon Basin could provide a ballpark figure for size distribution; 58

'Man did not weave the web of life: he is merely a strand in it. Whatever he does to the web, he does to himself.'

Chief Seattle, 1854.

per cent of their remnants are smaller than 20 hectares.

This type of basic information is becoming more critical as we gain a greater understanding of critical habitat resources and edge effects. For instance, the national 'Birds on Farms Survey' conducted by Birds Australia has shown that:

- * Biodiversity declined in patches of woodland smaller than 10 hectares.
- * Woodland dependent birds were 31 per cent more diverse in farm sites surrounded by other patches of woodland.
- * Woodland dependent birds were 12 per cent more diverse in broad strips of native vegetation, compared with narrow strips less than 50 metres wide.

Habitat degradation

Undoubtedly, the primary threat to conservation in the Moore Catchment is that posed by the rising saline watertable which threatens communities in the low-lying parts of the landscape.

Of the 4,000 vascular plant species in the agricultural region of Western Australia, 1500 species occur low in the landscape. Of these, 450 are endemic to the agricultural zone and are in danger of extinction as a consequence of rising saline groundwater.

GETTING MOORE TO THE POINT

To preserve our biological identity we need to be sensitive to the environment and adopt a precautionary approach.

This has a serious flow-on effect. The Department of Conservation and Land Management has reported a 50 per cent reduction in the number of waterbirds using wheatbelt wetlands due to saline-induced death of shrubs and trees.

Other factors that can degrade habitat include defoliation by livestock or problem native species (e.g. kangaroos, corellas), trampling, water extraction or drainage, weeds, disease, timber extraction, inappropriate disturbance regimes (e.g. frequency of fire and flooding) and pollution.

Predation by introduced species

Europeans introduced a number of species that prey on native animals. The fox has had a dramatic negative impact upon small mammals. The Department of Conservation and Land Management has had considerable success with baiting programs in reserves. The limitations to baiting are that it has to be maintained and there is a reluctance to bait on agricultural land and near towns because the baits can kill animals sensitive to 1080, including domestic dogs. The impact of feral and domestic cats is less well understood.

It is difficult to assess the exact magnitude of our impact on biodiversity because our knowledge base has major gaps in it.

In Western Australia, many species and communities have not been scientifically described and their resource requirements and conservation status are unknown. In many cases the traditional knowledge held

by Aboriginals has also been lost.

This actually poses the most significant threat to the conservation and management of biodiversity in WA, and in our own catchment.

A number of groups are taking proactive measures to address this issue. Herbariums have been set up throughout the catchment and many Landcare groups have been active in community bushland surveys. There are also many research institutions carrying out ecological investigations in the catchment.

However, these efforts are not reaching their full potential because there is limited coordination at both a local and catchment scale. Often the only way a farmer will find out that research is being done in the area is when they see an unusual car parked on the side of a gravel road. Similarly, the results from bushland surveys are not usually shared between Landcare groups, although they often contain relevant information.

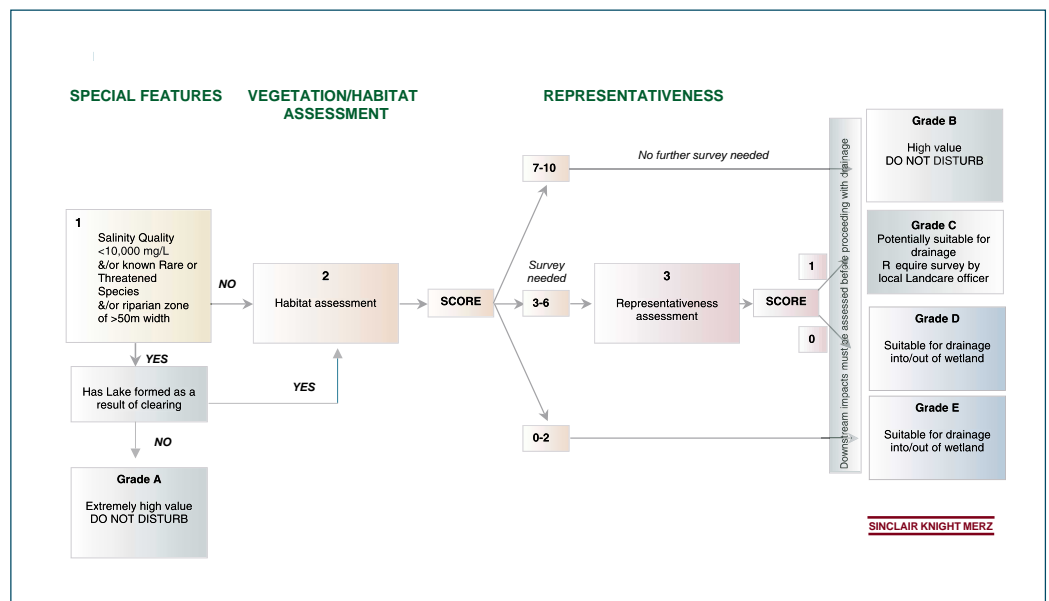
The research effort also needs to be prioritised. In particular, more research is needed on finding landscape designs

and management guidelines that can be implemented on the ground. According to bushcare facilitator Ann Maree O’Calaghan ‘the impact of fragmentation can be managed strategically’. Enhancing the capacity for farms to support biodiversity is essential because much of the catchment’s remnant vegetation is on private land. This can only be achieved through genuine partnerships in nature conservation. Options need to extend beyond fencing subsidies. The Native Vegetation Working Group supports market based options, such as ‘subdivisions for conservation’, and recommends tax-deductions for bushland management and differential rating.

Practical frameworks are also needed to assist individuals and government agencies in making informed and responsible decisions on potentially conflicting issues such as drainage works.

The Water and Rivers Commission has funded a project on assessing and managing drainage to lakes in the Moore Catchment. The system for ecological assessment that has been proposed by Sinclair Knight Merz is contained in the diagram below.

Decision tree for the conservation assessment of lakes in the Moore River catchment of Western Australia



We already know that particular areas of the Moore Catchment have a high conservation value ...

Key areas of the conservation estate within the Moore Catchment include:

- * Moore River National Park
- * Watheroo National Park
- * Mogumber Nature Reserve
- * Marchagee Nature Reserve
- * Pingarrega Nature Reserve
- * Capamauro Nature Reserve
- * Buntine Nature Reserve
- * Gilingarra Nature Reserve
- * Carot Well Road Nature Reserve

There are many more reserves, vested with different authorities for various purposes, and Crown Land throughout the catchment. The conservation value and subsequent management of these areas should be addressed.

A number of important vegetation associations also exist in the catchment, and include:

- * Heath vegetation communities located on rocky chert ridges between Carnamah and Moora. Cairn Hill north of Moora is

a good example.

- * Salmon gum and gimlet woodlands and associated understorey species in the north and eastern parts of the catchment.
- * Riparian vegetation fringing waterways and wetlands throughout the catchment.
- * Acacia shrublands showing a great diversity of species in the upper Moore Catchment.
- * Tuart stands located within secondary dunes near the mouth of the Moore River.



Entrance statement to the Watheroo National Park – heading west on the Watheroo Road.

Case Study – The Buntine–Marchagee catchment is an important site for natural diversity recovery

A 140,000 hectare area in the northern agricultural zone between Dalwallinu and Coorow has become the fifth recovery catchment for natural diversity under the State Salinity Strategy.

The Buntine–Marchagee catchment has been included following consultation with local landowners and catchment groups and has been endorsed by the Conservation Commission of WA and the State Salinity Council.

The area has high biodiversity values, including 39 species of native plants listed on CALM's priority flora list, and a range of mammals, reptiles and birds.

The sand plain in the southern part of the catchment is crisscrossed by saline drainage lines often referred to as braided channels. Many of the saline streams, pans and samphire areas are naturally saline but other parts of the catchment are at risk of increased salinity because of rising watertables.

CALM will coordinate the preparation of a recovery plan for the catchment, in close consultation with the local land conservation district committees and catchment groups.

The overall focus of the recovery strategy will be on-the-ground work on private farmland.

GETTING MOORE TO THE POINT

To preserve our biological identity we need to adopt a precautionary approach and our actions need to be **sensitive** to our natural surroundings.

Sensitivity is about treading lightly ... and discovering our biota is an unknown frontier.

Strategy 46

Promote cooperative inventory and monitoring programs for biodiversity in order to track the health of native species and to learn more about their resource requirements.

Strategy 47

Encourage the establishment and enhancement of strategic corridors, stepping stones and buffers to protect the viability of remnant patches of vegetation.

Strategy 48

Take a regional and partnership approach to weed, pest and disease management in order to use landowner and government resources efficiently.

Strategy 49

Increase the profile of high conservation areas and ecological communities throughout the catchment in order to involve as many stakeholders as possible in their protection.

Making a difference in the Moore Catchment

SEEDBANKS FIRST FOR GREENING AUSTRALIA

A possible international first initiative was launched by Greening Australia (WA) at Wyening Mission and Winery at Calingiri this month.

The day marked Greening Australia's \$300,000 commitment to the sustainable seedbanks project, which will involve the establishment of seed orchards across the State.

Director of Kings Park and Botanical Gardens Plant Science Dr Kingsley Dixon said the project was paramount at a time when some areas of WA had only 2 per cent of remaining bushland.

'WA, and the wheatbelt in particular, now has some of the most endangered flora on earth,' he said.

'The seed resources to meet the challenges of rebuilding overstorey and understorey in the wheatbelt can only be met by seed orcharding.

'Equipping local communities with local seed orchards found on sound genetic principles represents an outstanding initiative.

'Nowhere else are seed orchards being developed on the

scale or biological diversity represented by this project and the success of this program will fuel the engines of ecological restoration for decades to come.'

Wyening, in the Shire of Victoria Plains, was established as a farming outpost in the 1870s by Bishop Salvado, the founder of the Benedictine community of New Norcia. It is now owned by the Young family.

John Young said the seedbank site at Wyening was a demonstration site for everyone.

'We still have quite a bit of remnant vegetation on the property and we aim to have a rabbit proof fence up this year. We will direct seed understorey plants next year in small plots of each species.'

Greening Australia chief executive Wayne Grant said the choice of venue was particularly poignant since a main factor in the winery's closure in 1973 was the deteriorating quality of the vines under attack from salinity.

'Revegetation is a major weapon in the battle against salinity in this State but it cannot advance without adequate local plant seed stocks — our sustainable seedbanks project is an important initiative.



Seed orchard in the Shire of Victoria Plains

We are linked to the atmosphere through our survival.

I. Our Survival

‘I have often heard people from the Moore Catchment say that they like returning from a visit to Perth “because the air is so much cleaner at home.”’

The atmosphere is a **global environment** affecting every person and every living plant and animal. Human activities at a global scale have led to stratospheric ozone loss and the enhanced greenhouse effect (see figures on adjacent page).

These phenomena have local relevance to the Moore Catchment. Ozone depletion will influence the amount of DNA damaging radiation reaching the ground surface and the greenhouse effect will influence our climate.

It is difficult to generate local debate on the state of the atmosphere. In the case of the ozone layer, Australia has completely phased out production of CFC’s and halons. Under the Montreal Protocol, developing countries have until 2010. China is responsible for about 90 per cent of the world’s production of halon-1211 – Montreal Protocol calculations assumed that halon-1211 had peaked in 1998 but in actual fact emissions have since risen

by about 25 per cent. One can’t help to think that some issues are out of our hands.

Of greater concern to the person on the land is the question ‘will the status quo stand and if not how do I respond and adapt to change?’

Routine monitoring by the Bureau of Meteorology is now showing ozone depletion over the most populated parts of Australia all year round. Measurements at Halley Bay in Antarctica reveal that October ozone concentrations are now less than half what they were during the 1960’s. According to CSIRO’s Dr Paul Fraser ‘based on the maximum predicted emissions of ozone depleting chemicals allowed under the Montreal Protocol, it will be at least the year 2050 before the ozone layer recovers. Global warming may further delay recovery by 10-20 years.’

Australia, along with most other developed countries, did not meet the international target of reducing greenhouse gas emissions to 1990 levels by 2000. Global concentrations of greenhouse gases are certain to increase over coming decades, making some degree of climate change inevitable. Global surface temperatures have already

‘The atmosphere is unlike any other ecosystem on earth. It surrounds us and by virtue of this, it touches all living things.’

Australian Greenhouse Office

increased by 0.6°C during the 20th century. Australia warmed by 0.7°C from 1910-1999 with most of this increase occurring after 1950, and Western Australia has become 25% drier in winter. Climate modelling conducted by CSIRO, indicates moisture stress and drought will increase over time for the south-west of Western Australia. For example, the average number of days over 35°C each summer in Perth would rise from 15 at present to 16-22 by 2030 and 18-39 by 2070.

Evaluating how atmospheric changes impact on the Moore Catchment is vital: first, to assess the region’s vulnerability and secondly to enable the community to take proactive measures to cope with adverse changes and/or to take advantage of beneficial changes. Opportunities do exist for rural areas - global carbon trading is becoming an economic incentive to plant trees.

The need for adaptive responses to ultraviolet radiation and climate change is not widely accepted. As a consequence, there will be a range of institutional and behavioural barriers to overcome. Even on a personal level we are ignoring the warnings. Results from the most recent National Health Survey showed that only 54 per cent of the respondents always used some form of sun protection.

GETTING MOORE TO THE POINT

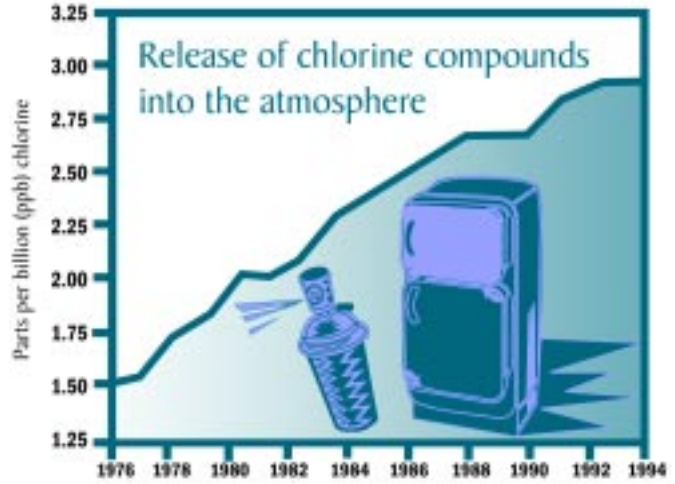
To improve our chances of survival in the long term we need to **adjust** to new atmospheric conditions.



Clear skies in the Moore Catchment – a view from the North Milling Road

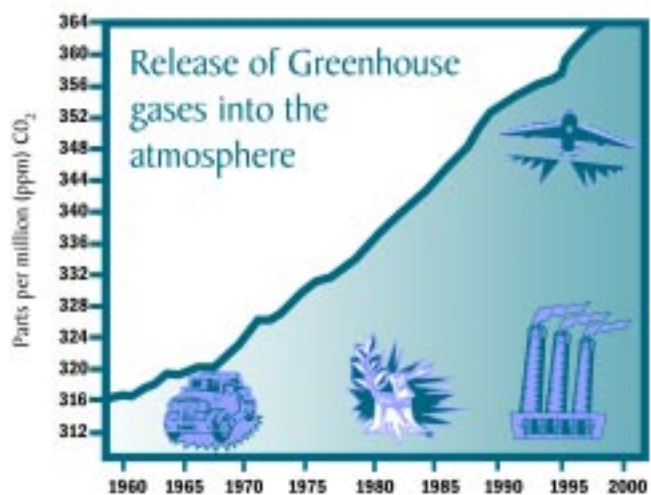
Damage to the Ozone Layer

Ozone gas molecules in the stratosphere are very important because they act as a protective shield. The ozone gas molecules absorb incoming ultraviolet radiation emitted from the sun, preventing it from reaching the Earth's surface. The natural balance of ozone has been disturbed by the production and emission of chlorofluorocarbons (CFCs), halons, carbon tetrachloride, methyl chloroform, hydrochlorofluorocarbons (HFCs) and methyl bromide. These compounds, which attack and destroy ozone when exposed to sunlight, have been used as refrigerants, foam blowing agents, industrial cleaning solvents, fire retarding chemicals and pest fumigants.



Enhanced Greenhouse Effect

Greenhouse gas molecules in the troposphere are very important because they act as a blanket. The greenhouse gas molecules absorb outgoing long-wave radiation emitted from the earth's surface, heating the lower atmosphere. The amount of heat trapped in the atmosphere depends primarily on the concentration of greenhouse gases and the length of time they stay there. The primary heat trapping gas in the atmosphere is water vapour, but because its natural concentration in the atmosphere is relatively high, inputs of water vapour from human activity have little effect. However, the concentration of other greenhouse gases such as carbon dioxide, methane and nitrous oxide are naturally small, so large inputs from human activity can have a substantial effect on the amount of heat trapped in the atmosphere. Major sources of greenhouse gases include power generation, transport, mining, forestry and agriculture.



Source: Australian Greenhouse Office.

Outcome 16 — Adjustment

Adjustment is about adapting to a new environment ... and discovering that change is inevitable.

Strategy 50

Raise awareness about the health risks associated with increasing ultraviolet radiation in order to encourage people working or recreating outdoors to take the necessary precautions.

Strategy 51

Encourage research towards identifying species or cultivars with broader environmental tolerances that could replace currently used crop and plantation species in order to reduce the region's vulnerability to ultraviolet radiation and climate change.

Strategy 52

Support improvements in long-range weather forecasting in order to help agriculturalists incorporate climate change in their land use decisions.

Strategy 53

Consider how climate change may alter the boundaries of local vegetation communities in order to assess its overall impact on conservation efforts.

Strategy 54

Encourage technical advancements in greenhouse gas abatement at the farm scale in order to provide farmers with economically viable management alternatives.

Making a difference in Western Australia

Huge sea network urged to aid weather forecasts

Scientists want an ocean observing network in the Indian Ocean to forecast changes in climate months before farmers, water managers and mariners in WA are affected.

The system of free-floating and moored buoys measuring atmospheric changes, salinity and sea surface temperatures would cover an area of more than 25 million square km.

The system, backed by remote-controlled planes, would benefit about two third of the world's population living along the Indian Ocean rim.

The network would be similar to one in the Pacific which successfully predicted big changes leading to the El Nino in 1997.

In the Indian Ocean, the network could help

predict the strength of rainfall events such as the Indian monsoon which influences winter rainfall in southern Australia. University of Colorado researcher Peter Webster — in Perth for the international conference, Oceans and Climate 2000 — called for international support for the network off WA.

The conference, which has attracted about 800 marine researches, was organised as part of the Indian Ocean Initiative set up in 1997 to focus on the decline of rainfall in the South-West.

Professor Webster said that information from the new system, particularly in agriculture, would allow farmers to change or rotate crops to the impact of approaching droughts or floods.

Perth was viewed as an important staging area for the entire Indian Ocean region.

At some stage in our lives we have all sat around the kitchen table and discussed how to launch an idea. The discussions have been with family members, neighbours and friends or with people that belong to the same organisation or community group. It may have even been with the bank manager.

To stand up from the table, with an issue resolved or a clear path to follow, transfers a strong sense of accomplishment to the individuals involved. When the idea is turned into a tangible or visible outcome, the feeling is stronger again.

In comparison, sitting around the table and talking about problems such as resource degradation and rural decline generates comments such as:

'Stop tinkering around the edges'

'Start looking over the fence'

'Fast track decisions'

'More pairs of hands'

'They didn't ask our opinion'

'We weren't told about that'

'Short term and restrictive funding'

'Preaching to the converted'

'Get the handbrake off'

The discussion often leaves us feeling frustrated. The difficulty lies in the fact that the issues are much bigger than the individual. Bigger means that the solutions are not clear-cut, global forces are usually at play, many people are involved and various groups and levels of government have a stake in the outcome.

In response to these big problems we have seen a proliferation of community or interest groups and government programs. For instance, the target of 2000 Landcare groups in Australia by the new millennium was passed in 1994. Add to this the vast numbers of Progress Associations, Agricultural Societies, Parents and Citizens Committees, Rotary Organisations, Lions Clubs, Mainstreet Committees — and the list gets bigger.

Similarly, on the government front, the Department of Commerce and Trade now offers a 'Community Wise Tool Kit' to guide people through the myriad of state and federal government assistance programs on offer.

Community groups and government programs have played an important role in the development of rural regions. The problem is there are fewer people available to take part in new initiatives, and at the moment the same faces are appearing on all the various committees.

One farmer said he could be out every night of the week attending

meetings if he wanted to. He didn't want that at the expense of spending time with his family.

Volunteering has been declining nationally since the early 1980s and has recently fallen below 20 per cent. Longer and less predictable work hours and a fear of commitment amongst baby boomers and younger generations are some of the explanations that have been put forward.

There are signs at a local scale and on a political front that we are at a stage of reappraisal. The newly elected Western Australian State Government is rationalising the way it services the community. An emphasis is being placed on establishing clearer agency roles and at the same time removing duplication of effort. Similarly, the Commonwealth Government is proposing to remove double handling of funds by allocating natural resource management grants directly to the regions.

At a local level many Landcare groups are taking proactive steps to move beyond trees and fences — they are looking at sustainable options from both an economic and environmental perspective. According to Calingiri farmer Steven Woods, alternative farming practices and enterprises are being trialled by Landcare groups across the district. He believes that integration is the key — linking traditional farming approaches with new ideas from researchers, sharing information and avoiding reinventing the wheel.

Another Calingiri farmer, Michelle Freeman, who is the driving force involving city kids in revegetation, notes: 'Many of us have been quietly working away on our own properties, replanting and fencing. Linking our activities and identifying how we can fit into the bigger picture makes a whole lot of sense.'

The way forward hinges on building partnerships and making collaborative decisions.

1. Building partnerships in the Moore Catchment

Focus: Networking, negotiation, strategic planning.

Case study: There are many cases where regional or catchment groups are in a position to receive government funding but they are unable to implement the project effectively at a local level.

Two full-time positions have been funded to promote sustainable land and water management options across the entire Northern Agricultural Region. The positions are actually based in the Shire of Victoria Plains, however the partnership set up between the Shire of Victoria Plains, the Liebe Group,

the regional natural resource management group (NAIMS), the State Salinity Council and the Natural Heritage Trust ensures the objectives are met across the region.

There is less administration at a regional level, so NAIMS can focus on supporting local groups by securing funds and streamlining projects. The partnership with the Liebe Group significantly expands the officer's contact base.

Benefits: Professional staff are attracted to country towns; local capacity is built; information and resources are shared between groups.

Lesson: Cost sharing underpins strong partnerships and boosts public and private investment.

For each strategy contained in this document there is an opportunity to build or cement a partnership in the Moore Catchment.

The Moore Catchment Group will play an integral role in brokering partnerships in the region.

2. Making collaborative decisions in the Moore Catchment

Focus: Methods of public participation, connecting disciplines.

Case study: Many issues in the community are discussed at meetings, forums or conferences.

Despite having the opportunity to listen to different viewpoints and debate the merits of those views, we often do not take the next step and arrive at a collaborative decision. This severely dampens any plans for quick action.

In natural resource management the problems are complex and often a trade-off between competing interests is needed. Science can and must inform the debate – but society must choose its own path forward.

A number of research organisations in Australia, including Land and Water Australia, the Australian National University and the Cooperative Research Centre for Weed Management Systems, are jointly researching the merits of alternative modes of public participation. These include consensus conferences, deliberative polls and citizen's juries.

A citizen's jury approach was applied to the management of a national park in Australia. The results showed that the method offered the potential to provide informed, deliberated public opinion on significant topical issues.

Benefits: Can be used to bridge the gap between the general

public, experts and politicians. Provides for consensual outcomes rather than antagonist responses.

Lesson: Effective public participation underpins the confidence of communities to deal with their problems collectively.

For each strategy contained in this document there is an opportunity to decide on a set of realistic and community owned actions to implement it.

The Moore Catchment Group will play an integral role in involving the wider community in making decisions that impact on the future of the region.

Indicators of success

The Moore Catchment Group wishes to evaluate the success of this strategy in a meaningful way.

The strategy is fundamentally about the way people interact with the environment. Assessments limited to physical indicators, such as nitrogen loads in the Moore River Estuary, will not capture the full intent of this document.

Assessing the success of this strategy is about evaluating the performance of people — the efforts of individuals, groups and government to address priority issues. Stakeholders can relate to indicators such as the number of genuine partnerships that have been created in the catchment and how many real actions have resulted from these partnerships.

Social and economic indicators are warranted in the assessment of the success of the Moore Catchment strategy. There is certainly still a place for physical indicators, especially for 'state of the environment' reporting.

Building partnerships and making collaborative decisions leads to action.



Its in our hands.

People and the Landscape • Our Wellbeing • Pride

Strategy 1

Raise awareness of our natural and cultural features in order to foster a sense of belonging in the Moore Catchment.

Strategy 2

Build leadership capacity and group skills within the community so that ambitious and innovative projects are undertaken in the Moore Catchment.

Strategy 3

Find interesting ways to promote the Moore Catchment in order to involve locals and attract people from outside the area.

People and the Landscape • Our Wellbeing • Cohesion

Strategy 4

Facilitate open lines of communication in order to provide avenues for expressing the diversity of interests in the Moore Catchment.

Strategy 5

Support families in their nurturing and educating roles in order to recognise how important they are to the social fabric of the Moore Catchment.

Strategy 6

Coordinate government policies, programs and agencies operating in the Moore Catchment to increase efficiency and achieve outcomes desired by the community.

People and the Landscape • Our Wellbeing • Participation

Strategy 7

Promote images of neighbours and groups taking action to improve the Moore Catchment in order to encourage greater community involvement.

Strategy 8

Actively harness the skills and resources already available in the Moore Catchment in order to develop self-reliance and continuity.

Strategy 9

Give greater recognition to the voluntary contributions of community leaders and representatives in the Moore Catchment so that the associated costs to family, work and leisure time are acknowledged.

People and the Landscape • Our Wellbeing • Commitment

Strategy 10

Focus on opportunities that benefit everyone from seniors to young people in order to build a stronger and healthier community.

Strategy 11

Promote alternative and value-added agricultural and home-based enterprises that have positive economic, social and environmental returns in order to encourage long-term diversification in the Moore Catchment.

Strategy 12

Acknowledge, harness and enhance the efforts and potential of local businesses and service providers to create opportunities within the Moore Catchment.

People and the Landscape • Our Home • Conservation

Strategy 13

Trial environment-friendly technologies in the Moore Catchment in order to encourage future investment in sustainable resource use.

Strategy 14

Engage households, businesses and industry in source reduction practices in order to lessen the impact of the Moore Catchment community on the environment.

Strategy 15

Find practical ways to overcome the barriers for recycling, reuse and cleaner production in order to fix leaks in the human consumption chain..

People and the Soil • Our Livelihood • Acceptance

Strategy 16

Emphasise the urgent need for conserving soil resources that will not be affected by salinity in order to safeguard a profitable and sustainable agricultural industry in the Moore Catchment.

Strategy 17

Communicate that in some cases dryland salinity will not be reversible in the Moore Catchment so that rural adjustment networks are put in place now.

Strategy 18

Ensure that the investment of public resources in salinity recovery, containment and adaptation in the Moore Catchment are made on realistic bases and address true management priorities so that the investment is effective.

People and the Soil • Our Livelihood • Collaboration

Strategy 19

Collaborate with landholders to monitor soil condition and related inputs and outputs in order to provide essential data for identifying areas at risk of land degradation and assessing various treatments.

Strategy 20

Encourage strategic alliances or partnerships between Landcare groups, production groups and government in order to develop specific enterprise packages that farmers will adopt and that generate environmental benefits.

Strategy 21

Build new business opportunities from saline land in order to find innovative and profitable ways of living with salt in the Moore Catchment

People and Water Supplies • Our Health • Protection

Strategy 22

Communicate the critical importance of high quality groundwater for town water supplies in order to gain government and community support for reducing and eliminating contamination risks.

Strategy 23

Develop government/industry partnerships for land uses that have the potential to adversely impact on the quality of groundwater supplies in the Moore Catchment so that best management practices can be more widely communicated and implemented.

People and Water Supplies • Our Development • Allocation

Strategy 24

Encourage efficiency in water use through improvements to methods of agriculture and irrigation in order to increase land use options in the Moore Catchment.

Strategy 25

Determine the water requirements for environmental features in the Moore Catchment in order to refine surface and groundwater allocation limits.

Strategy 26

Establish and maintain a bore and river monitoring network in order to quantify the risk of saline water from the Moore River contaminating the coastal and Perth Basin aquifers.

Strategy 27

Position abstraction bores at a sufficient distance from waterways to prevent saline river water being drawn into the bores and to maintain the discharge of fresh groundwater into the waterway.

People and the Floodplain • Our Security • Mitigation

Strategy 28

Maintain an effective flood forecasting system in the catchment in order to give people living in flood prone areas adequate time to initiate emergency procedures.

Strategy 29

Maintain agency and public awareness of flood warning and emergency responses in order to overcome complacency and the problems associated with the turnover of staff and residents in flood prone areas.

Strategy 30

Utilise land use planning and advisory tools to encourage development outside the 1 in 100 year flood level of the entire Moore River and its tributaries in order to decrease the potential for future flood damage in all parts of the catchment.

Strategy 31

Explore avenues for funding flood mitigation works in order to share the costs equitably and reduce existing anxiety and future social disruption to the community.

People and Waterways • Our Pathway • Recovery

Strategy 32

Prioritise the Moore River and its tributaries into sections of intact, recovering or degraded reaches in order to help river managers prioritise and cost out river rehabilitation efforts.

Strategy 33

Explore avenues for providing landowners with funding assistance for river and tributary rehabilitation so that works can be designed and implemented within a catchment framework.

Strategy 34

Recognise and promote the traditional, historic and contemporary associations that the community has with the Moore River and its tributaries in order to foster a caretaker ethic towards the region's waterways.

People and Waterways • Our Playground • Enhancement

Strategy 35

Promote the natural beauty and ecological functions of the various waterways in the catchment so that people see waterways as more than just a drain or channel.

Strategy 36

Support and expand the existing water quality monitoring program in order to establish targets and incentives to reduce nutrient losses from specific sub-catchments.

Strategy 37

Demonstrate and promote how different land uses positively and negatively impact on the region's waterways so that sensitive land use planning and management are central to future decisions.

Strategy 38

Redesign existing recreational sites and facilities so that they protect the local environment and at the same time improve the social and economic potential of waterways in the region.

People and the Ocean • Our Backyard • Investigation

Strategy 39

Collaborate with research institutions to assess the state of the marine environment offshore from the Moore River Estuary so that a benchmark exists for monitoring change.

Strategy 40

Address any land-sourced pollution problems on a catchment basis in order to communicate best land and water management practices and develop consistent performance targets for industry, the community and government authorities.

Strategy 41

Take responsibility for improving the quality of stormwater running off the catchment after large rainfall events in order to reduce the flush of nutrients and sediments to the marine environment.

People and the Biota • Our Senses • Investment

Strategy 42

Provide opportunities for people to learn and enjoy their natural surroundings to build an understanding of the intrinsic values of biodiversity.

Strategy 43

Communicate that biodiversity losses in soil microorganisms, pollinators and other species are counter-productive to enhancing agricultural productivity so that efforts are directed towards mimicking and preserving ecological functions in the landscape.

Strategy 44

Balance the exploitation and preservation of biological resources in the Moore Catchment to ensure that options for the future are not compromised.

Strategy 45

Support local projects developing the commercial potential of our biodiversity in order to harness the catchment's intellectual property and increase returns to the community.

People and the Biota • Our Identity • Sensitivity

Strategy 46

Promote cooperative inventory and monitoring programs for biodiversity in order to track the health of native species and to learn more about their resource requirements.

Strategy 47

Encourage the establishment and enhancement of strategic corridors, stepping stones and buffers to protect the viability of remnant patches of vegetation.

Strategy 48

Take a regional and partnership approach to weed, pest and disease management in order to use landowner and government resources efficiently.

Strategy 49

Increase the profile of high conservation areas and ecological communities throughout the catchment in order to involve as many stakeholders as possible in their protection.

People and the Atmosphere • Our Survival • Adjustment

Strategy 50

Raise awareness about the health risks associated with increasing ultraviolet radiation in order to encourage people working or recreating outdoors to take the necessary precautions.

Strategy 51

Encourage research towards identifying species or cultivars with broader environmental tolerances that could replace currently used crop and plantation species in order to reduce the region's vulnerability to ultraviolet radiation and climate change.

Strategy 52

Support improvements in long-range weather forecasting in order to help agriculturalists incorporate climate change in their land use decisions.

Strategy 53

Consider how climate change may alter the boundaries of local vegetation communities in order to assess its overall impact on conservation efforts.

Strategy 54

Encourage technical advancements in greenhouse gas abatement at the farm scale in order to provide farmers with economically viable management alternatives.

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Acknowledgments

My sincere appreciation is extended to the Water and Rivers Commission and the Natural Heritage Trust for giving me the opportunity to work directly with the Moore Catchment Group to develop a strategic plan for natural resource management in the catchment.

The project has delivered what it set out to achieve: a strategy document that will get people moving in the same direction and towards the same end point — towards a sustainable way of life in the Moore Catchment. Every component of the strategy embraces the Moore Catchment Group's vision of building stronger links between people, the economy and the environment.

In the year of the volunteer, I would like to acknowledge the efforts of all the community representatives on the Moore Catchment Group. Thank you Michael Anspach, Brian Cahill, Elizabeth Eaton (strategy subcommittee), Fiona Falconer, Roger Forte (strategy subcommittee), Harry James, Barry Johnson, Bill Lullfitz, Cynthia McMorran, Helen and John Nankivell, Jim Ovens, Dahlia Richardson and Harry White.

The assistance of local government authorities and state government agencies is appreciated. Thank you Richard Boykett (Operations Officer, Department of Conservation and Land Management), John Braid (Coast and Clean Seas Coordinator, Ministry for Planning), Robyn Cail (Liebe Group), Jason Carter (Project Coordinator for Improving Surface Water Management in the Upper Moore Catchment, Moore Catchment Group), Nancy Gannaway (Development Officer, Agriculture Western Australia), Alexandra Gartmann (Community Landcare Coordinator, Shire of Victoria Plains), Jill Kerby (Leader, Mt Lofty Ranges Catchment Program, South Australia), Ann Maree O'Callaghan (Regional Bushcare Facilitator, Department of Conservation and Land Management), Sean O'Loughlin (Water Corporation), Jason Menzies (Promotions Manager, Oil Mallee Association), Duncan Peter (Senior Development Officer, Agriculture Western Australia) and Peter Stubbs (Chief Executive Officer, Shire of Moora).

A number of people in the Water and Rivers Commission have provided integral information and advice for the strategy. Thank you Rick Bretnall, Marion Burchell, Eugene Chee, Phil Commander, Misha Cousins, Verity Klemm, Syl Kubicki (strategy subcommittee), Peter Muirden, Luke Pen, Ron Shepherd (strategy subcommittee), Louise Stelfox and Matt Viscovich. I would also like to recognise the high level of professionalism displayed by Tara McGovern from Brown Cow Design.

A special thanks to everyone who gave me support above and beyond the call of duty. Thank you Pop for the photographs, Mum for your company on field trips, Dad for your guidance on strategic planning and Georgina for your words of encouragement.

Strategy author,
Jonelle Black.

Dedication to Syl Kubicki, District Leader, Water and Rivers Commission who passed away suddenly on 9 March 2001. On his last day at work he finished reviewing this strategy.

People can come into your life for a reason, season or lifetime.

When someone is in your life for a reason it is usually to meet a need you have expressed. They have come to assist you through a difficulty, to provide you with guidance and support, to aid you physically, emotionally or spiritually. They may seem like a godsend, and they are! They are there for the reason you need them to be. Then, without any wrong doing on your part, this person will say or do something to bring the relationship to an end. Sometimes they die. Sometimes they walk away. Sometimes they act up and force you to take a stand. What we must realise is that our need has been met, our desire fulfilled, their work is done.

Anon

Do you live in the Moore Catchment?



'I think ... knowing the community and being involved in the community makes you belong.'

Michael Anspach, Moore Catchment Group

If you are interested in progressing the strategies contained in this document please approach your local Moore Catchment Group member. Up to date contact details are held at each Shire office.