

Peel-Harvey Catchment Council

THE FUTURE OF NATURAL RESOURCE MANAGEMENT IN THE PEEL-HARVEY CATCHMENT

**A Paper for Discussion and Resolution by the
Peel-Harvey Community**

TABLE OF CONTENTS

Topic	Page
Foreword	3
1. Introduction	5
2. Background of NRM in the Peel-Harvey Catchment	7
3. Hydrology	10
4. Water Quality	16
5. Conservation – Flora and Fauna	23
6. Fisheries	27
7. Coastal Environment	30
8. Soil Resources	33
9. Current NRM Volunteer Contribution	38
10. Policy and Planning in the Catchment	40
11. Integrated Catchment Management in the Peel-Harvey	49
12. Consultation Process From Here	56
Bibliography	58

FOREWORD

If there was any debate over whether Integrated Catchment Management is a necessary process for the long term future of the Peel-Harvey Catchment, this Discussion Paper alone provides sufficient evidence of why it is needed.

Each natural resource element is presented in terms of its current status, trends and issues, current management responses and future options. As this Paper is read, it will become obvious how interdependent each the natural resource management issues are.

Choices we make for the management of one issue will have significant implications for the health of another.

It is unlikely to surprise any reader that each natural resource management issue presented is under strain, primarily the result of human interaction.

There are serious decisions that need to be made on the future direction of natural resource management in the Peel-Harvey. We need to plan a future for our surviving pieces of bushland, our rivers, our rare fauna and flora and all the components of the ecosystem which support it and us.

We have limited human and financial resources, which means that a strong push in one direction will mean compromises in another, yet these decisions must be made.

The Peel-Harvey Catchment Council and the Peel-Harvey Officer's Group have committed themselves to developing a relevant and workable catchment plan. From their formation in November 1999, both of these groups have acknowledged the importance of a high level of broad community input into the planning process.

A valued and workable Catchment Plan will only be developed from good information. The scientific community in the Peel-Harvey have contributed their knowledge of present issues in the Peel-Harvey, along with the community based Peel-Harvey Catchment Council, in this document.

What we need now is for you to contribute your knowledge, views and suggestions about the options we have, for creating the best future that we can for the environment of the Peel-Harvey Catchment.

Many of the issues which are presented here, are ones that we have been struggling with for over 100 hundred years. These are problems that have developed over a long time and only a long-term plan will be able to ameliorate them.

New issues will continue to arise, our rapidly increasing population is placing even more stress on our coast lines and rivers and again we be required to make hard decisions. For example how much of the river foreshore should be allocated for recreation and how much should be reserved to protect the river's important riparian vegetation?

For each question there will be different sectors of the community that agree and disagree, but we must work together to over come these differences, because to do nothing will be disastrous for all of us.

Each of the chapters presented in this Paper asks difficult questions for which we need your input. It is critical that we develop an overarching plan that shows how community, government and industry can work on all of the issues together and not in isolation.

With a plan we can work towards a commitment from governments, the community and industry, that will help us work toward a healthier environment and thereby a better future.

Jan Star

Chairman

Peel-Harvey Catchment Council

Ch. 1 INTRODUCTION

Intent of This Document

This discussion paper is the first step in preparing a long-term plan for the future of our natural resources in the Peel-Harvey Catchment. This paper aims to generate discussion on the management options we have for our land, bush and water resources.

We genuinely seek your considered responses on the issues and options we have presented. The feedback we receive will be used to guide the strategic direction and preparation of a long-term plan for the Peel-Harvey Catchment.

In order to obtain good feedback we have attempted to provide a base level of information for each issue in the following categories:

- Current status
- Current trends and issues
- Current management responses
- Options for future management

An explanation of geo-political boundary versus water catchment issues together with some discussion on the philosophy and intent of integrated catchment management have been included to provide the background from which this process is developing.

In November 1999, after many years of discussing the benefits and disadvantages of a catchment management group, the Peel-Harvey Catchment Council was formed. A commitment was made by the community and natural resource management agencies to work together and value both community information and scientific information.

The Peel-Harvey Catchment Council is comprised of ten members of the Peel-Harvey community who are selected on a skills basis. They work with the Peel-Harvey Officers Group, comprised of representatives from State and Local Government and Landcare Development Officers employed in the region.

The Council has committed to a long and difficult process of planning, managing and evaluating the sustainability of the Peel-Harvey Catchment and its ecosystem. This paper represents the first step in attempting to clarify all the issues that need to be considered in a catchment plan for the Peel-Harvey.

The Peel Harvey Catchment Council hopes this document will assist in building a cooperative approach to natural resource management in the Peel Region and help achieve its vision of

“People Working Together for a Healthy Environment”.

This document is about finding out what people think needs to happen and is an important step in the constructive dialogue which needs to take place between all sectors of our community.

Ch. 2 BACKGROUND OF NRM IN THE PEEL-HARVEY CATCHMENT

The history of the Peel-Harvey catchment is best described in the book "Peel-Harvey, The Decline and Rescue of an Ecosystem," written by Keith Bradby (1997). This book describes the Peel-Harvey system from when the Aboriginal community managed the land, European settlement, agricultural expansion, the first signs of the Peel-Harvey problem to the first signs of repair and improvement work.

It has been a long struggle, since the first plea for help was made in the early 1960s. The Peel-Harvey story is equally fascinating in its description of how we as a society have managed problems through time. It is a story of human change and our collective influence on the place where we live, and on the places where someone or something else lives. This has been a process of moving from environmental degradation and finger pointing, to environmental repair and successful working partnerships.

From the first report of industrial pollution in 1895 (Bradby, 1997) all users of the estuarine and river systems in the Peel-Harvey have continued to pollute this resource, although often unknowingly at the time.

Since the beginning of colonisation of the South-West, there have been continual arguments over who owns the rivers and hence who is responsible for its management? It is of significance, that we have shifted the argument from who owns the rivers to who owns the foreshore and riparian land around the rivers. This is still an issue of contention today with the release of the Peel Regional Planning Scheme, and shows how far we have to go to achieve a sustainable and equitable balance in our land and water management.

From the 1890's onwards, the people in the area started to notice that the plain was becoming wetter. This was considered to be due mostly to large areas of Jarrah forest that had been logged in the Darling Range and therefore increasing the surface water run off onto the plains. This was only the start of an on-going battle that we've continued to have with water allocation, distribution and drainage issues. Whilst we have made significant progress in identifying processes in the water cycle and understanding that we as people are only one user in the system, we have a long way to go before we develop a system that equitably distributes water between the environment and the different stakeholders in our community.

We can't go back to the original system, so we have taken it upon ourselves to try and account for the many different variables that effect water management in the Peel-Harvey. The Water and Rivers Commission play a central role in determining allocation and there is a clear role here for community and government combined decision

making and making use of groups like the Peel-Harvey Catchment Council.

“There can be no doubt that clearing and drainage had changed the annual cycles of the estuary. The input of silt probably had the greatest impact. Before wide spread clearing and drainage, the water reaching the area through the Serpentine and Harvey rivers would have been relatively clear and silt free. Now it was muddy and carrying large quantities of fine silt and organic matter,” (Bradby 1997).

“Perhaps the C.S.I.R.O. could evolve some method to counteract the weed that is taking hold of the estuary at Mandurah. Where the netting grounds once used to be is now covered by this thick weed and it is impossible to fish there. It is general throughout the estuary now. In a very few years the estuary will be unworkable from a fishery point of view, unless something in the cycle of events starts to move this weed away.”

Inspector J.E. Bramley, Fisheries Department, 1947. Taken from Bradby, 1997.

“By the late 1950s, it was obvious that the estuary was not just suffering a temporary fluctuation. Infestations of pink slime had become a regular hazard to fishers. It was particularly severe in both Peel Inlet and Harvey Estuary during the dry winters of 1957 and 1958, when the ocean bar was almost closed. Despite the fact that little, if any, research was undertaken into the cause of the weed, the Fisheries Inspector recorded in 1957 that “the main reasons advanced for it are the superphosphate washed into the estuaries by the winter rains from farms and the condition of the bar”. (Bradby 1997).

In 1971 the Peel Inlet Conservation Advisory Committee was established which became the Peel Inlet Management Authority in 1977. Before then, however, the first formal mechanisms for improved environmental management came from the local councils. “A co-ordinated government and community approach to the decline in the health of the estuary was slowly evolving – but evolution can be a long and tortuous process.” (Bradby, 1997)

By 1970 all sorts of theories had been put forward on the decline of the health of the estuary, but most came down to three major concerns:

- the alteration of water flow through widespread drainage and construction of dams on the Scarp,
- insufficient flushing of the estuary, and
- animal manures and chemical fertilisers were washing in from the farmlands and polluting the water.

From 1976 to 1980, a study of the Peel-Harvey system was undertaken with the primary aim ‘to further our understanding of the working of estuarine ecosystems in south-western WA...and to determine the cause

and mechanisms of weed growth and accumulation in the Peel Inlet'. (Bradby, 1997).

Government scientists and universities continued to study the estuary and determine the processes involved in its declining health, but were unable at this stage to recommend solutions which was a cause of great frustration to the Mandurah community.

The 1985 Stage 1 Environmental Review and Management Plan (ERMP) confirmed that a 'three-pronged approach' was necessary: that engineering works to increase flushing would succeed only if carried out in conjunction with the fertiliser efficiency program, and that continued weed clearing would be necessary for many years to come.

Stage 2 of the ERMP was not completed until May 1988. Many farmers saw the threat of being told to give up farming, not being able to use fertilisers and having to plant their land to trees as a serious threat to their existence and became angry and suspicious of government plans. At the same time though, farmers were entering the Landcare movement and taking practical steps to revegetate the landscape and start restoring the ecosystem of the Swan Coastal Plain.

The Landcare movement was a key to the large scale, on-ground action that was needed. At the beginning, little was known about the best methods for revegetation and other land management issues. The Community Catchment Centre was opened in Pinjarra in September 1990 and originally staffed by people from the (then) Department of Agriculture, also had Officers from the (now) Department of Conservation and Land Management and the Water and Rivers Commission. The Catchment Center had the aim of forging strong links with the rural community and was about developing on the ground approaches to landcare instead of conducting further research.

While formal "catchment plans" were being written by scientists, it was the on-ground work from farmers and interested volunteers from the urban community where the real "catchment management" took place. Land Conservation District Committees were formed, and over time these groups have become empowered decision-makers on improving all aspects of their natural resources.

There were several attempts through out the years to establish a formal "Catchment Management" body. Although the government agency responsible for the development of a "Catchment Management" process continually bought up the issue with the community, it was many years before the broad community saw the value in a regional catchment management planning group to complement the on-ground work that they were doing.

Ch. 3 HYDROLOGY

Current Status

The Peel Harvey catchment has a surface area of 11,378 km². Three landform features, the Coastal Plain, the Darling Scarp, and the extensive wheatbelt to the east of the Scarp, dominate the physical geography of the catchment.

The catchment has a Mediterranean climate with hot, dry summers and cool, wet winters. Rainfall across the catchment varies considerably with an average of 840mm on the coast rising to 1,300mm on the Darling Scarp and reducing again eastwards to 500mm or less per annum.

Similarly, the average annual evaporation rate varies in the catchment from 1,200mm per year in the south to 1,500mm in the north. Monthly evaporation rates vary from 50mm in June to about 300mm or more per month in January.

Three river systems, the Serpentine, the Murray and the Harvey Rivers dominate surface water flows. In average years the Murray and Harvey catchments provide similar levels of inflow to the Estuary, together being about 80% of the total inflow. However, in flood years the Murray by far dominates the system. Figure 3.1 provides a diagrammatic model of the discharge into the Estuary.

Alterations to Natural Flow Regimes

Surface water hydrology has been significantly altered through human activity since European settlement. Land clearing in most areas of the catchment and drainage activities on the coastal plains has significantly increased surface water run-off. In other areas, surface water impoundments along the Darling Scarp have reduced river flows (ERMP 1998, WRC 1998, WRC 1999).

An estimated 4,000km of drains have been constructed on the coastal catchment, while across the total catchment the land has been approximately 85% cleared, primarily for agricultural purposes. The effect of both these activities has been to reduce the retention time of surface waters within the catchment, thereby increasing peak flow rates and total flow rates as well as reducing the duration of flow events.

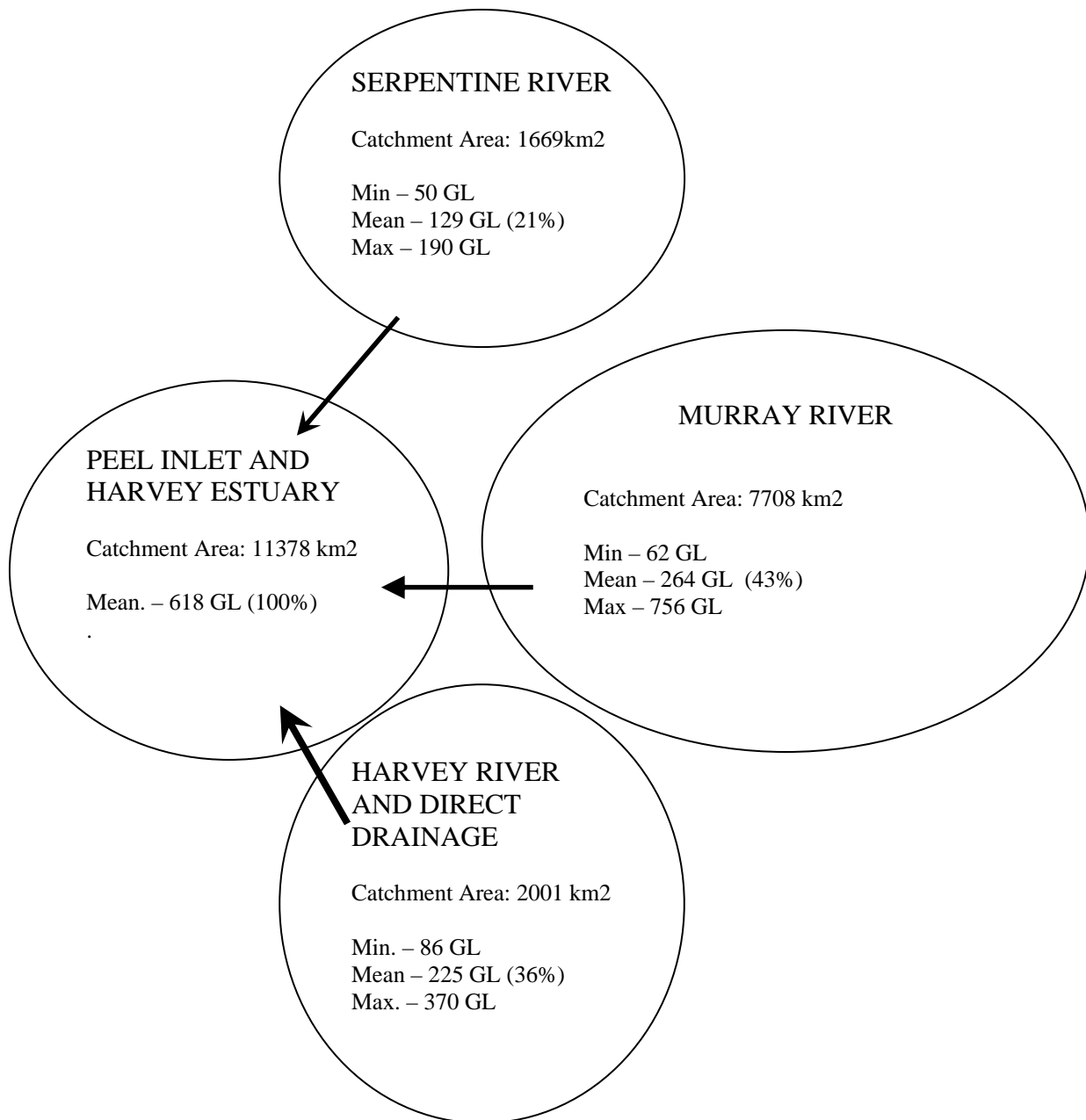
There are 19 surface water impoundments of note within the Peel-Harvey catchment with a total storage capacity of 679 gegalitres, the most significant of these are indicated below in table 3.1. It should be noted, however, that the Murray River proper and its main tributaries, the Hotham and Williams Rivers, remain free of significant storages.

Table 3.1 – THE FOUR LARGEST SURFACE WATER STORAGES

STORAGE	FULL CAPACITY – GL	% ANNUAL LOCAL FLOW
South Dandalup Dam	204	790
Serpentine Dam	194	340
North Dandalup Dam	75	290
New Harvey Reservoir (under construction)	70	68

(McComb and Lukatelich)

Figure 3.1 Note: GL = Gigalitre = 1 billion litres



Groundwaters

Within the Peel-Harvey coastal catchment there are three groundwater aquifers to consider in catchment management. Moving from surface to depth, the first is the superficial aquifer, followed by the Leederville formation (which for management purposes is divided into the Upper and Lower strata), and the Cattamarra aquifer. The following three paragraphs have been condensed from the *Groundwater Allocation Plan: Murray Groundwater Area* (WRC, 1998).

The superficial aquifer is a near surface, unconfined aquifer with great seasonal variation. Groundwater levels within the superficial aquifer vary from 1 to 4 metres a year and during the winter can often be seen at the surface. Water level variations are greatest adjacent to the Darling Scarp where 2-4 metre ranges in water levels are common. Salinities within the superficial aquifer generally increase in the direction of groundwater flow, which is generally east to west. Total dissolved solids within the superficial aquifer waters range from 500 milligrams per litre adjacent to the Darling Scarp to as much as 5,000 milligrams per litre near the Peel Inlet. Recent declines in surface water levels have been noted, however, these are generally attributed to the drier than average rainfall years in recent times.

The Leederville aquifer is a confined aquifer lying under the superficial. The Leederville formation ranges in depth from approximately 30 to 300 metres. Hydrographs indicate a seasonal variation in water levels, though this varies across the Coastal Plain. Over the last 5 years there appear to have been some declines of potentiometric head within the Leederville aquifer. The reason for the decline is not clear. In some areas water level behaviour reflects that of the superficial suggesting that the aquifers are hydrologically linked, at least in parts. The quality of the water in the Leederville aquifer varies although generally can be considered to behave similarly to the superficial aquifer with lower dissolved solids near the Darling Scarp and increasing to the west.

The Cattamarra aquifer underlies the Leederville and varies in depth from 150 metres in the east down to 400 metres in the west. Hydrographs of artesian wells within the Cattamarra indicate a decline in the potentiometric surface in some areas with some wells showing a decline of 2-3 metres over the last 5 years. It is considered likely that this depressurisation of the aquifer is due to groundwater abstractions from the Cattamarra aquifer for industrial purposes near Pinjarra. Further to the north and south the groundwater levels in artesian wells appear to be relatively steady. Groundwater salinity in the Cattamarra aquifer is generally brackish to saline though there are areas of freshwater close to the Darling Scarp.

East of the Darling Scarp groundwater usage is not licensed and therefore not as intensely monitored as on the Swan Coastal Plain. The

significant issue in the east is rising saline water tables and the impacts of salinity.

Current Trends and Issues

Over the last decade there has been significant increase in public and political awareness and interest in water resource management issues. One culmination of this interest and a driving force behind current water resource management was an agreement made by the Council of Australian Governments (COAG) in 1994.

Two of the key thrusts of this documentation were for the setting of environmental provisions or environmental flows and for the moving of highly allocated water systems to a system of tradeable property rights in water. The COAG agreement has required water law reform across Australia.

In Western Australia the Rights in Water and Irrigation Act 1999 sets out a new model for water allocation within the State. This legislation ensures that in areas of high water allocation, community water allocation committees will be formed for establishing water entitlements and rights including those of the environment.

Within the Peel-Harvey catchment environmental water provisions and allocations have been set as part of the background work for the Water Corporation's Stirling Harvey Redevelopment Project and are currently being considered for the Murray and Serpentine Basin allocation planning.

On the Swan Coastal Plain drainage management practices have been coming under scrutiny as people grapple with issues associated with nutrient management within the estuaries and lower reaches of the rivers.

Within the Peel Harvey Catchment there are continuing pressures for urbanisation near the Peel Inlet. Some of the development pressure is within the floodway of the river system forcing particular issues associated with floodway management.

Current Management Responses

Surface Waters are managed for allocation in a variety of ways, depending on location.

The Murray River basin is a Proclaimed Catchment, meaning that the taking or diversion of water is a licensable activity. Past policies have seen this licensing attributed primarily to the third order streams within the basin (i.e. the rivers themselves).

Impoundments on the Harvey and Serpentine Rivers allow storage of water for urban, industrial, and agricultural water supply. The Water Corporation sells and distributes water from most of those impoundments, the majority of which is for urban water supply. Water is also supplied to the irrigation areas in Harvey and Waroona Shires.

Environmental Water Requirements (EWR) and Provisions (EWP) have been set for the Harvey basin as part of the assessment work relating to the construction of the new Stirling-Harvey Dam. EWRs are currently being developed for the Serpentine and Murray River Basins.

The Water Corporation currently manages significant surface water drainage systems under a community service obligation to the State Government. Drainage systems are designed and managed to provide a three-day drainage service for the flooding created by the type of storm event that can be expected twice per year (0.5 Annual Rainfall Index).

Local governments make land-use decisions within a floodway or flood fringe areas, with advice from the Water and Rivers Commission. Generally development is discouraged in a floodway, but may be permitted within the flood fringe with certain conditions.

Most of the coastal catchment is covered by proclaimed groundwater areas, allowing licensing of all groundwater abstraction except domestic urban use.

Several areas, where public drinking water supply is either abstracted or proposed, have special status as Underground Public Drinking Water Area. This allows for special land-use controls administered by the Water and Rivers Commission for protection of drinking waters.

Most new groundwater licenses are being directed towards use of the superficial aquifers. Preferred use of the Leederville Aquifer is for Public Supply purposes.

Options for Future Management

- Re-engineering of the coastal surface water drainage system to slow water's movement and restore ecological functions of the system.
- Improve coordination between the Catchment Council (looking at broader natural resource management issues) and Water Allocation Committees so that the two aspects of natural resource management can work in tandem. This would require advanced information sharing between the groups
- Economic developments on the Swan Coastal Plain can look at new and creative ways of storing and using superficial aquifer water and

surface flow waters for beneficial use without compromising, and perhaps enhancing environmental features.

- Environmental water requirements and need to be developed and provided for the Peel Harvey Catchment. There will be a need for ongoing assessment and monitoring of environmental water provisions and allocations to ensure that a sustainable balance is achieved.
- Continued licensing of rural and urban non-domestic water use from the Leederville and Cattamarra aquifers.

Ch. 4 WATER QUALITY

Current Status

Water quality in the main bodies of the Peel Inlet and Harvey Estuary has visibly improved since the construction of the Dawesville Channel. There have been no blooms of *Nodularia* (a toxic blue-green algae) in estuarine basins since the channel's construction. This is primarily the result of increased salt water intrusion from the ocean which has prevented the germination of *Nodularia* akinetes (seeds) in the bottom sediments. Additionally, water clarity has improved with light penetration increased by 0.2-0.4 metres compared to pre-channel conditions (WRC).

However, phosphorus and nitrogen nutrient concentrations remain high enough in the Peel Inlet and Harvey Estuary to support algal blooms. Primarily these blooms are now dominated by harmless marine species of phytoplankton. The estuary still experience nuisance levels of macroalgae (seaweed) but now at biomass production rate of four to sixteen tonnes per annum as compared to forty to sixty tonnes per annum prior to the construction of the Dawesville Channel (WRC).

Water Quality in the estuarine reaches of the Serpentine, Murray, and Harvey Rivers remains problematic.

Nutrient levels in the lower Serpentine River are on average well above the Australia and New Zealand Environment and Conservation Council (ANZECC) Guidelines for aquatic ecosystem health (WRC). Algal blooms, including *Nodularia*, have required the closure of parts of the river to recreational contact every summer since the completion of the Dawesville Channel.

The Murray River is generally in better shape than the Serpentine River, with phosphorus levels of an acceptable level. Nitrogen levels remain high, particularly during winter flows. The Murray River has suffered over the past few years from micro-algal blooms, primarily from species of marine diatoms and dinoflagellates. These algal species are not toxic but create nuisance foams on the river which may contain high bacterial loads forcing the rivers to be closed for contact recreation during the hottest summer periods.

The Harvey River continues to incur a very high nutrient load, and algal blooms are common. The Harvey is not monitored as closely as the Murray and Serpentine due to its isolation and much lower recreational use.

In the Coastal Plain portion of the catchment the Water and Rivers Commission monitors fourteen sites regularly. Results of this monitoring vary from site to site, but nutrient levels generally exceed the

ANZECC guidelines regularly (WRC). Agriculture Western Australia also monitors ten sites, which exhibit similar nutrient levels (Somers, pers. com).

A water quality snapshot taken 31 August 2000 of the Serpentine catchment highlighted continuing water quality problems. Of 220 sites well dispersed sites only 58 sites (or 26 percent) recorded total phosphorus levels at or below the ANZECC guideline of 0.1mg/L. The median score was twice the guideline value, and 31 percent of the samples exceeded the guidelines by fivefold or more.

Only 21 sites (or 10 percent) were below the guideline of 0.75 mg/L for total nitrogen concentrations. The average for total nitrogen was 1.8 mg/L meaning that over 50 percent of sites sampled had more than double the recommended levels. It should be noted however that these guidelines are for the protection of aquatic ecosystems and that many of the sampling points are best described as agricultural drains.

Salinity levels also continue to rise in many parts of the catchment, particularly in the Murray River catchment east of the Darling Scarp.

Current Trends and Issues

A trend analysis has recently been performed on five years of catchment water quality data by the Water and Rivers Commission (refer Figures 4.1 and 4.2.). No significant improvements in water quality were detected in the analysis. However, four sites had appreciable increases in total nitrogen concentrations while six had appreciable increases in total phosphorus concentrations.

The outcome of these catchment results is that total phosphorus loads for the Serpentine and Harvey Rivers continue (on average) at a level above the targets set by the EPA for the Peel Harvey estuarine system.

Effectively this means that given enough freshwater inflow through a significant flood event the return of a *Nodularia* bloom in the main bodies of the estuaries remains a real possibility.

Even in absence of a *Nodularia* bloom in the estuaries, the social and economic impacts of algal blooms in the Murray and Serpentine rivers continue unabated. The chances of further serious toxic algal blooms increases while the nutrient concentration levels remain high.

Increasing salinities in areas of the catchment is rendering some water supplies unfit for human, stock, and agricultural production, as well as having a growing ecological impact.

Current Management Responses

Considerable effort has been directed towards nutrient management on the Swan Coastal Plain over the past decade or more. The Dawesville Channel was constructed to gain immediate improvement in estuarine water quality.

Changes have occurred in fertiliser practices. Licensing of known point source pollutant activities has increased. State Planning Policies have been put in place to improve land-use planning measures for nutrient export control.

Landcare by community groups in the catchment has seen over 400km of drains streamlined with native vegetation to approximate more natural drainage systems.

Agriculture Western Australia has done considerable research into the use of bauxite residue as a nutrient retaining soil amendment. Millions of trees have been planted east of the Scarp in an effort to reduce recharge to saline groundwater.

But despite the effort to date, water quality is still a serious and, apparently, worsening problem. It may be that changes in, and intensification of land-use are overtaking gains made in practices in more traditional land-uses such as extensive grazing.

It may be that polluted groundwater plumes are acting like ghosts of past land-use practices. It may be that we are already doing the right things, but the scale of effort needs to greatly increased to make the changes needed.

On a positive note, interstate and overseas experience suggests that we have made a substantial start but still need to increase our efforts to overcome the legacy of nutrient rich groundwater and extensively cleared land. After all, it took 100 years to reach this point and will take considerable time and effort to restore a balance to the landscape.

Options for Future Management

- A tightening of land-use planning policies requiring all new land-use proposals to fully demonstrate a reduction in current nutrient generation rates.
- A greatly increased effort (with provision of funding and resources) in landcare activities, particularly streamlining waterways and water courses.
- A targeted program for introduction of cleaner production technologies for all nutrient generating land-uses, e.g. organic industry

- A considerable re-engineering of drainage systems to reduce flow rates and promote nutrient retention within the catchment landscape.
- Broadscale use of nutrient retentive soil amendments and slow release fertilisers.
- Targeted trials and use of nutrient amendment products in watercourses.
- A comprehensive re-assessment, investigation, and improvement in management practices of point source industries. This could include assessment of the feasibility of developing and introducing measures such as tradable “Nutrient Permits”
-
- Investigation into the potential for “environmental marketing” where nutrient and other targets are set and regional producers who meet the targets can market themselves as “environmentally friendly” etc. Similar to the energy rating system used for marketing appliances

Figure 4.1: Monitoring results for Total Phosphorus in the Peel Harvey Catchment

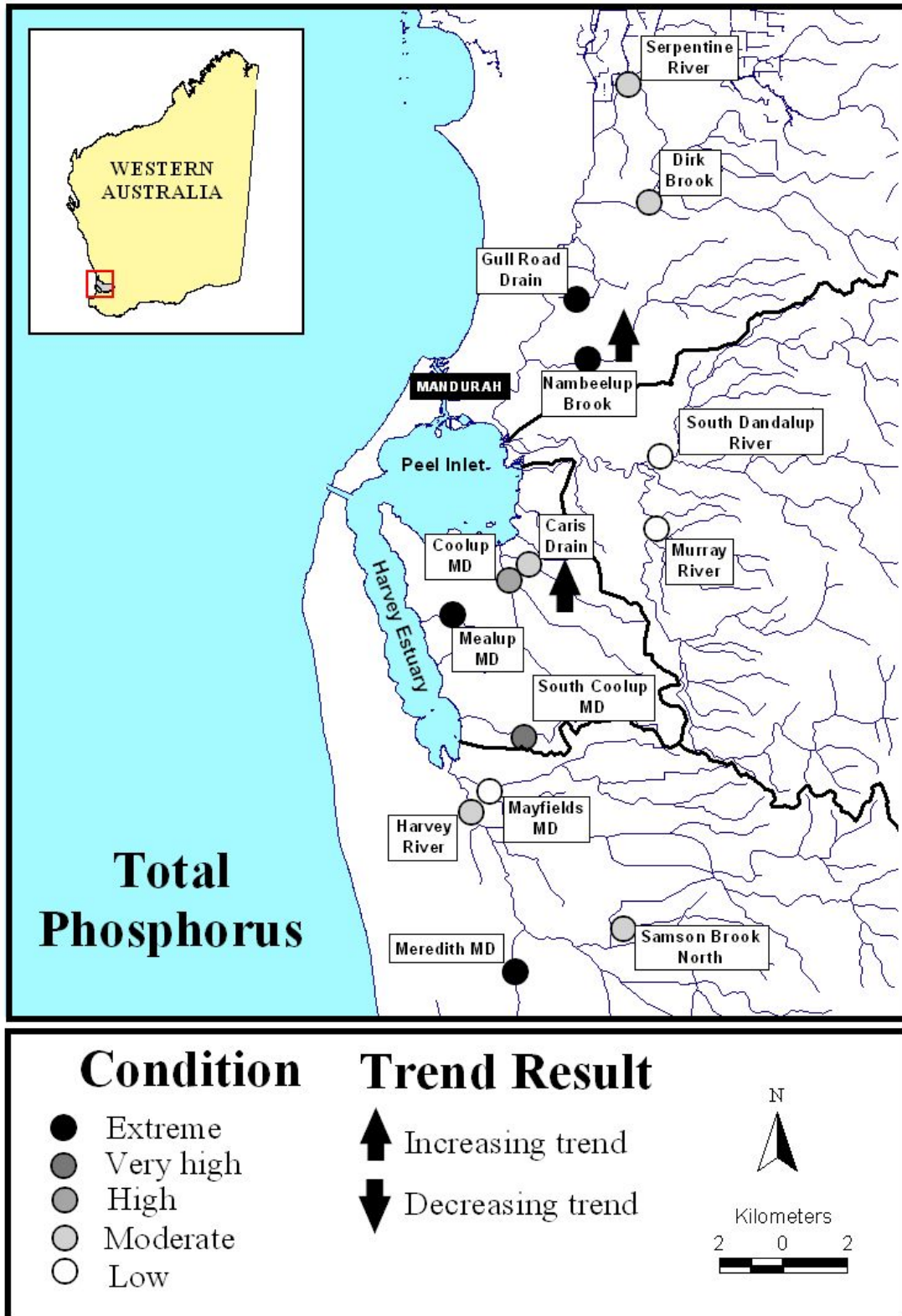


Figure 4.2: Monitoring results for Total Nitrogen in the Peel Harvey Catchment

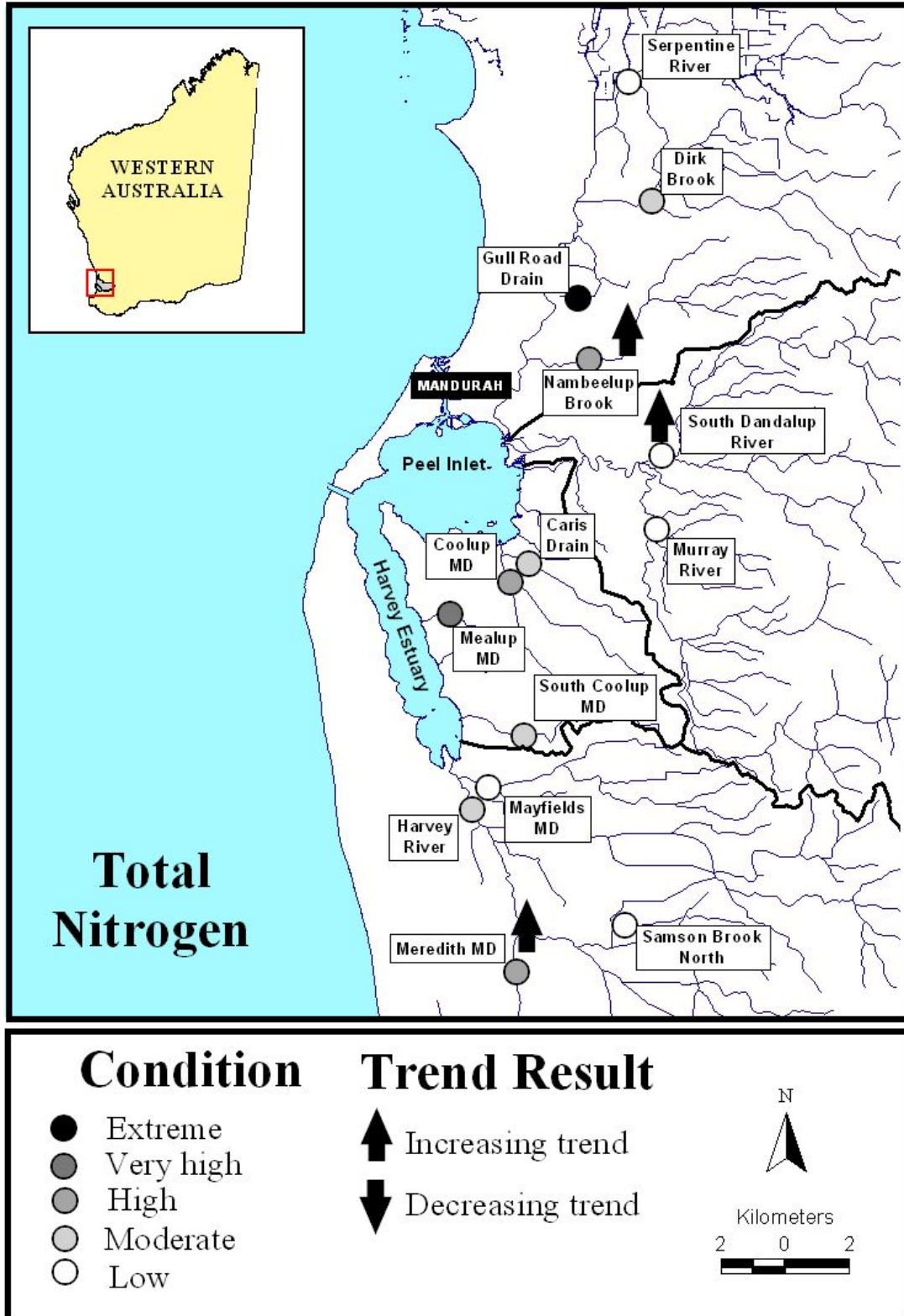
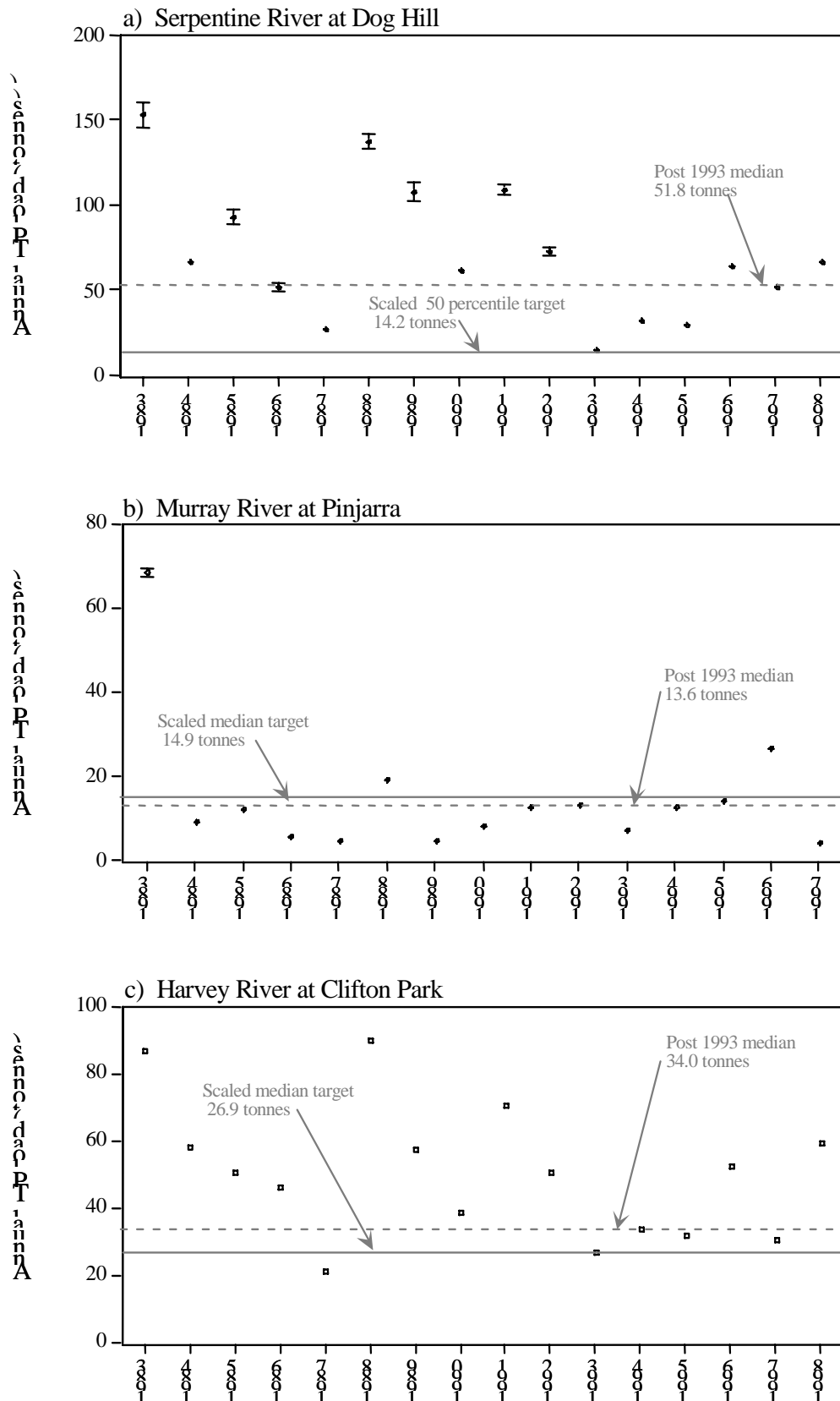


Figure 4.2 - Total phosphorus loads for the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton Park with scaled targets and median loads since 1993 superimposed. Error bars are standard deviation units from 100 randomisations for each year.



Ch. 5 CONSERVATION - FLORA AND FAUNA

Current Status

The isolated fragments of vegetation classed as remnant, modified, or scattered throughout the Peel-Harvey Catchment are increasingly being regarded as a valuable, but threatened resource. A comprehensive description of the major soil types and their associated vegetation systems is detailed in the Peel-Harvey Catchment Natural Resource Atlas.

The Pinjarra Plain, Spearwood, Bassendean and Darling systems are the most widespread soil types and are characterised by marri woodland and flooded gums, eucalypt woodland, banksia low woodland, and jarrah forest respectively. The mapping of these broad systems are well documented.

The extensive clearing on the Swan Coastal Plain (over 95%), drainage of seasonal and permanent wetlands, and the extent and diverse nature of the region, is reflected in the dramatic variation in the conservation status of flora and fauna communities. It is widely acknowledged that many plant communities are threatened and wildlife habitats are therefore compromised. Lists of extinct and threatened mammals and birds are available, however few formal surveys, especially over the extent of the Peel-Harvey Catchment have been carried out.

Many people have developed a heightened awareness of, and are voicing strong concern over the fate of native plants and animals. In addition to the activities of Land Conservation District Committees (LCDC's) regarding agricultural and conservation issues, many "Friends of Groups" have, and are being established. Their value to natural resource management is measured not only in the amount of on-ground work they achieve through volunteer labour, but also by the awareness raising and action they generate amongst other land managers, including Local Government Authorities.

The concept of saving flora and fauna on public lands for public good through volunteerism is essential for on-going conservation of our dwindling natural resources. This work on public land is complemented by significant areas of conservation in private ownership, which should be recognised and encouraged through formal and financial mechanisms.

Current Trends and Issues

Local catchment plans and Land Conservation District strategies reflect the value that is placed on our remaining native flora and fauna by both NRM bodies and landholders living in the catchment. Objectives include the use of planning processes to protect remnant communities and to ensure management plans are devised and options for implementation

are available. However, there is a need for good information on what is actually left of our natural landscape. This is a priority. Mapping of remnant vegetation has been undertaken on a number of occasions and this information needs to be collated and made available for the whole catchment.

Remnant vegetation continues to be lost through clearing and degradation processes. Habitat values have also been reduced by the resulting fragmentation. Two of the most severe pressures currently being exerted on remnant vegetation are land subdivision and new settlement.

Urban development, particularly on the coastal strip is severely impacting entire ecological communities or leaving isolated populations under threatening conditions.

Within the northern region of the Peel-Harvey Catchment are a number of Bushplan sites representing the regionally significant ecological communities and habitats on the Swan Coastal plain of Perth metropolitan region. Other mechanisms are used to protect significant remnant vegetation on public land, and they include nature reserves, National Parks, Regional Parks, LGA reserves, Ramsar Wetlands and foreshore riparian zones. Other State Government agencies own or manage land that should be governed with the similar interests in mind.

There is currently a clearing moratorium on the Coastal Plain Catchment. However, the effectiveness of this Ministerial Condition is questionable, especially as it only applies to land zoned for agriculture. In addition, much of the vegetation in the catchment is called "regrowth", and can be misrepresented.

These small isolated remnants are compromised by:

- Exposure and edge effects
- Competition from introduced plants and animals
- Changes in hydrology
- Changes in soil structure and/or nutrient balance
- Changes in the fire regime
- Loss of essential links in the ecosystem e.g. pollinators.
- Diseases (phytophthora sp.)

Current Management Responses

Apart from the aforementioned Bushplan sites on private land in the north of the catchment, there is little information relating to size, condition or management status of significant remnants on private land. Landholders who are prepared to place their land under a covenanting system - Remnant Vegetation Protection Scheme (Agriculture Western Australia), CALM Conservation Covenants, or National Trust Covenanting program - receive subsidies, incentives and management advice. In addition, Land for Wildlife (CALM) is a voluntary scheme that

aims to encourage and assist landholders to provide habitat for wildlife on private land.

While some covenanting systems provide land management advice and limited financial support (e.g. fencing), there is not always the possibility of rate reduction. Rates can become especially high and land taxes continue to be applied to land that is being taken out of agricultural production. The Shire of Serpentine-Jarrahdale has introduced a Conservation Zoning package, which aims for a rate reduction in exchange for a voluntary management system on significant remnants.

Other related issues that are cause for conflict and concern, are those regarding vesting (the great variation in conditions), management and resource dollars. These issues are highlighted when a community group is prepared to voluntarily manage a piece of bushland for one or a number of land managers. A possibility being explored is the joint vesting of land, enhancing the availability of resources, support and management options.

Declared rare flora and threatened native animals are the focus of projects both within state natural resource management agencies and community groups. Of considerable concern is the availability of relevant and current information, especially when access to this information affects the decisions on future management options.

The development of partnerships between a number of stakeholders can reduce the burden on the dwindling resources for natural resource management bodies. An integrated peak catchment management body would be ideally suited to facilitate a cross-pollination of information, which would otherwise require considerable expense to procure.

Many schools within the catchment are taking an active role in management of their “patch” flora and fauna. This role includes weed control, revegetation, seed collection and propagation, waterway, wetland and fauna monitoring. The values that these students develop are commonly transferred through their networks to other people living within their community.

Options for Future Management

The future options for conservation of flora and fauna need to take into account not only environmental, but also social and economical considerations. Some management systems, touched on earlier, will continue to play an important role in our conservation efforts – covenanting programs, financial incentives, technical advice and the continued support for “Friends of Groups”.

In addition, there a number of exciting avenues which are being explored, which will encompass the varied and diverse characteristics of nature conservation in the Peel-Harvey catchment. It is vital that these

initiatives receive more than just "in principle" agency support. This is especially significant when we consider that land in the Peel-Harvey has high financial values. Other options could include:

- Community fox and rabbit baiting programs – working across cadastral boundaries, such as local government areas and park borders, and along corridors like rail reserves in a program that is primarily for public benefit.
- Monitoring programs that include all facets of the community and other land managers, building on other very valuable programs – Ribbons of Blue, Birds Australia, Frogwatch, Waterwatchers, etc.
- Ecotourism ventures, where part of the experience involves hands on conservation activities and planning.
- A revolving bushbroking fund to enable purchase of valuable ecological communities with a view towards long-term conservation.
- Road Reserve conservation or rehabilitation schemes that, through a partnership between LGA's and adjacent landholders, reclaims or restores degraded or ecologically threatened road reserves of high conservation value.
- Junior community conservation groups (such as the Serpentine Bushland Group Bush Buddies, and the Waroona CALM Bushrangers) which expand on the already admirable work carried out by many of the local schools, encompassing an environmental component to the curriculum.
- A scheme to broker carbon credits for large tracts of reserved land, as a means of raising funds to maintain conservation values in perpetuity.
- Innovative subdivision design where belts of bushland are maintained as a reserve from the original property, employing financial incentives and the application of covenants.
- A plan for identifying and allocating resources to protection of remnant bushland across the entire Peel-Harvey catchment. (This would then link in with BushPlan to the north and the work being undertaken by Melaine Sargeant in the Leschenault Catchment to the south).
- Proposals being developed for new regional parks.
- An effective information system which enables stakeholders easy access to natural resource information on the status of bushland in the Peel-Harvey Catchment and provides a focus on target outcomes. (Integrated /linked with Peel Centre for Water Excellence?)

The Peel-Harvey Statement of Planning Policy Number 2 sets a target of 50% of the Swan Coastal plain catchment to have perennial vegetation. In addition to saving the remaining patches, we need to also consider how to expand our focus and plan for corridors, east to west across and north to south.

Ch. 6: FISHERIES

Fisheries WA is responsible for the management of the State's fish resources and habitats, covering inland freshwater, estuarine and coastal environments. The Peel-Harvey catchment is an important water system in terms of recreational and commercial fish stocks, both native and introduced. Marron, trout, freshwater cobbler and redfin perch inhabit the fresh water upper reaches of the catchment, including several irrigation dams. The three principal rivers draining this catchment, Murray, Serpentine, and to a lesser extent Harvey, support populations of black bream and mullet and provide important fish nursery areas. The culmination of these rivers is the Peel-Harvey Estuary, which primarily supports blue swimmer crab and mullet fisheries.

Current Status

Freshwater

The freshwater component of the Peel-Harvey Catchment, managed by Fisheries WA, includes Waroona, Samson Brook, Drakes Brook, and Logue Brook Dams, and the Murray River up stream from Pinjarra. These systems support recreational fisheries of marron, trout (stocked), redfin perch and cobbler.

Estimated Recreational Freshwater Catch; Peel-Harvey Catchment 1999-2000

	Marron	Trout
1999	42 500	20 000*
2000	50 400	NA

* Half of all trout caught were released

Estuarine

The Peel-Harvey Estuary supports an important commercial and recreational fishery. Commercial catch statistics for 1998-2000 are presented in tonnes per fishery.

Commercial Catch (t); Peel-Harvey Estuary 1999-2000

	Crabs	Mullet	Prawns	Cobbler	Whiting	Herring	Tailor
1998/99	54.9	168.7	1.9	1.8	18.5	4.5	3.7
1999/00	62.3	83.5	0.6	6.1	17.3	7.8	2.3

Following an extensive recreational fishing survey conducted in 1998/99 by the Fisheries Research and Development Corporation, the estimated recreational crab catch for the Peel Harvey Estuary is 289 tonnes, nearly five times that of the commercial catch.

Current Trends and Issues

Aquaculture

The aquaculture industry in the Peel region is experiencing annual growth in overall production and value. It includes marron, silver perch, goldfish and koi carp, ornamental fish, and black bream. The unique freshwater ecosystems of the Peel-Harvey catchment and the biodiversity of the aquatic fauna found there, particularly the native freshwater crayfish, need to be protected against introduced species such as yabbies. As such, yabby production is restricted to the east of the “yabby line” from Perth to Albany, effectively limiting yabby aquaculture in the region to the east of Boddington, Marradong, and Quindanning.

Aquaculture licenses for freehold land should not adversely affect other fish or the aquatic environment. Activities involving open systems with effluent discharge, bores, soaks, stream diversions, or that are inside declared catchment areas require approval from other relevant authorities including Local Government, Department of Environmental Protection, and Waters and Rivers Commission.

Freshwater

Major concerns with the marron fishery relate to its ability to withstand the existing level of fishing pressure, particularly in low rainfall years, which are linked with poor recruitment. Post season reviews are conducted regularly and can result in changes to management. In 1988-90 the marron season was closed due to over fishing. The total annual catch for the marron fishery in 1998/99 was estimated at 20 tonnes, which has declined from an estimated 50 tonnes in 1990 (Fisheries WA 2000).

Current management of the licensed marron fishery revolves around a short open season, size and bag limits, and fishing gear restrictions. A review of snaring may result in more “snare only” areas. Snare only waters, first introduced in the 1990 season, have received widespread support from the community. This method of Fisheries Management is aimed at decreasing undersize marron mortality by actively selecting larger legal size fish. The popularity of snaring as the sole method of capture increased to over 30% in 2000 (25% in 1998). Currently, the Peel-Harvey catchment has one snare only area at Samson Brook Dam.

Challenges to managing the trout fishery include the limited number of waters suitable for trout, predation by redfin perch, environmental changes and reduced streamflow wrought by catchment land use such as dam construction. These issues have resulted in a need to evaluate different stocking strategies such as yearling trout as opposed to fry.

Estuarine

The number and overall abundance of fish species, including crabs, in the Peel-Harvey Estuary, are now greater than prior to the opening of the Dawesville Channel in 1994. This presumably reflects the absence of toxic blue-green algal blooms, the maintenance of higher salinities for longer periods and an increased recruitment of marine species as a result of tidal water flow through the Dawesville Channel (Potter, de Lestang, and Young, 1998).

Commercial fishing in the Peel -Harvey Estuary has decreased by 50% since 1997 following voluntary Government buy backs of fishing licenses. Fishing activity has since centered on the development of a dedicated crab pot fishery eliminating undersize crab, and by-catch mortality.

Options for Future Management

- Protecting the biodiversity of the Peel region is a Fisheries WA responsibility, and includes native and introduced fishes and invertebrates, as well as habitat conservation and re-establishment. Pressure on these aquatic resources arises from an increase in recreational fishing, as well as dam construction, particularly private farm dams, and the effect of salinisation in the upper reaches of the rivers.
- The future management of the marron fishery will need to focus on improving compliance within the fishing season, increasing the use of snares rather than scoop and drop nets, and better identifying fishing pressure and the stock condition in specific waters (Fisheries WA, 2000).
- Environmental and water quality degradation is also a major issue, as is the loss of traditional recreational fishing waters due to an expanding drinking water supply scheme. These all need to be addressed through catchment management measures.
- Key actions for the future management of the trout fishery will include the development of specific management arrangements for individual water bodies, meeting translocation risk assessment criteria, identifying the interactions between trout and native species, continued supply of suitable stock, and facilitating increased community ownership of the fishery.
- Management of estuarine fishes, particularly crabs, continues with legislative enforcement of bag and size limits, in conjunction with an expanding community awareness program involving 30 volunteers.

Ch. 7 COASTAL ENVIRONMENT

Current Status

The coastline of the Peel Harvey catchment is formed by the littoral drift of sand particles carried northward by currents originating in the roaring forties. A seasonal pattern of accretion and erosion forms a natural cycle whereby sand is deposited on shore in summer leading to a build up of dune systems, while in winter storms the sand is washed off shore. Where extensive reef systems occur, such as in the Halls Head area, winter erosion is less severe.

In a stable beach sand cycle, what is lost in winter will be replaced in the summer. Where a system has become unbalanced, winter losses cannot be restored by natural means because sand has been removed from the system by either being blown inland or washed too far out to sea (Oma et al, 1992).

Dune systems are characterised by a mobile primary fore dune and a series of secondary dunes. Vegetation of dune systems is highly specialised for survival in a low water, low nutrient, wind blown and salty environment. Continued coverage of vegetation, particularly of colonising foredune species, is critical for dune stability.

The most extensive and intact dunal systems are held within the Yalgorup National Park and at Port Kennedy, the majority of the remaining coastal environment is designated to become urban living areas, although to the south of Melros there are pockets of rural zoned land.

Current Trends and Issues

The major trend impacting the coastal environment is urbanisation. The City Of Mandurah has seen rapid urban expansion since the mid 1960s, principally as a result of its location between the estuary and the sea. In the years between 1991 and 1996, the city grew by a phenomenal 38% (Peel Development Commission, 1997). Relatively cheap land prices, proximity to Perth and the recreational and aesthetic opportunities afforded by the estuarine and marine environments fuel this growth rate.

Rockingham has experienced similar growth, while Preston Beach is becoming more popular as a holiday and retirement destination being roughly half way between Mandurah and Bunbury.

Correspondingly there has been an increase in recreational pressure on the coastal environment. While the coastal vegetation, which binds sand dunes together, is tough, it is not able to withstand damage caused by inappropriate recreation such as sand boarding, trail bike riding and four wheel driving

These recreational pressures are further aggravated by coastline change, which can be either natural or induced. One of the City of Mandurah's recent studies tracked shoreline stability over the time that aerial photos are available. The study found that the two main areas of erosion are those which have been affected by the construction of groynes.

The permanent opening of the Mandurah Channel affected beaches to the north, particularly in the Ormsby Tce area. The construction of the Dawesville Channel has, in a similar fashion, interrupted the littoral flow of sand northwards to the detriment of beaches in the Falcon area. Sand bypassing did not manage to pass sufficient volumes of sands in the first few years after the opening of the Channel, and the Department of Transport has had to provide financial assistance to help manage the erosion until some equilibrium is achieved.

In 1996 the South Metropolitan Coastal Waters Study noted significant elevations of chlorophyll *a* concentrations in waters near the Dawesville Channel when compared to background levels. The report noted that "These elevations are a direct result of the outflow from the Peel Harvey Estuary and indicate that the outflows are having a measurable impact on surrounding coastal waters. The ecological impact of these outflows on adjacent benthic communities is currently unknown".

Since that time monitoring within the estuary has shown that chlorophyll *a* levels have dropped and that this will substantially decrease any impact on marine benthic communities as a result of reduced outflow.

While data on near shore water quality was scant prior to the Channel construction, the observed effects have been in accordance with the predictions for dispersion of nutrient rich outflow in general (WRC and DOT 1998).

Current Management Responses

Coastal management in the catchment is a combination of policy controls and on ground rehabilitation. From Madora to Lake Preston there is a string of active local coast care groups.

These groups work in association with the relevant local government authority to manage programs for brushing, seeding, planting and fencing. Such projects are often funded through Councils and the Coast Care Coast West grants program, an arm of the Natural Heritage Trust.

The presence of the Yalgorup National Park also means that CALM is a significant player in coastal management responses, and the CALM Rangers have excellent working relationships with the councils and coast care groups involved.

Planning related responses include the constant pressuring by local governments for the widest possible foreshore reserve. Under the current system, the determination of a foreshore reserve width is the decision of the Ministry for Planning. The current policy sets an average of 100 metres as a guide. The Ministry is currently reviewing its position on coastal foreshore reserve widths, and has undertaken the preparation of a Statement of Planning Policy.

Councils also require with any new development the preparation of a foreshore management plan, which must be prepared to Council's satisfaction.

Options for Future Management

- Continued community involvement in coastal management is essential. As the majority of Australians continue to choose a coastal location to live, community recognition of how coastal ecosystems function and how to live within those limits is important. Education of new residents will become an important strategy, and should be given serious consideration at budget time.
- At the same time, local land managers will need to continue to find the difficult balance between recreational needs and environmental preservation. Greater funding through Coastcare will assist in the completion of community based planning solutions.
- Finally, the Ministry for Planning review of its current practices in determining foreshore widths will be important. It is hoped that review will finally provide certainty and a basis for decision making that values the sustainable use of the coastal environment.

Ch. 8 SOIL RESOURCES

Current Status

Landform Descriptions

The Peel-Harvey catchment has two distinct geomorphic regions being the 'Swan Coastal Plain' and the 'Darling Plateau' separated by the Darling Fault commonly referred to as the Darling Scarp. The Swan Coastal Plain covers the majority of the catchment area. On the east boundary, the Swan Coastal plain consists of a series of alluvial deposits. The associated landforms include westward sloping foothills below the scarp and the Pinjarra Plain. The western side is dominated by a series of three dune systems or aeolian deposits ranging in age from oldest in the east to youngest in the west. A summary is included below:

Ridge Hill Shelf

Situated at the foothills of the Darling Scarp, the westward sloping Ridge Hill Shelf is a narrow strip (1 to 3 km in width) of stream deposited alluvial fans and remnant marine terraces. In some areas residual laterite can be seen on the surface.

Pinjarra Plain

The Pinjarra Plain refers to the stretch of alluvium deposits running parallel to the Darling Scarp slopping very gently westward. To the west, at the junction between the Pinjarra and Bassendean systems, there is a complex of sand and clay soils. Natural drainage is poor with frequent swampy areas. Finely textured mottled soils and yellow grey clays dominate these low-lying areas, while mottled duplex soils dominate the central part of the landform.

The soils of the Pinjarra Plain landform are the most productive of the Swan Coastal plain for grazing. In the eastern areas soils have good nutrient holding ability, although low permeability in some areas can lead to salt accumulation. The problems associated with poor natural drainage has been alleviated to some degree by the artificial drainage network.

Bassendean Dune System

The Bassendean Dune system is the oldest system of dunes on the Swan Coastal Plain. The system lies west of the Pinjarra Plain and consists of low hills of leached siliceous sands interspersed with sand flats and seasonal swamps. The soils have low fertility, poor nutrient holding capacity and are susceptible to water logging and flooding resulting from high ground water levels.

These sandy soils usually have adequate reserves of groundwater to supply irrigation of pastures and horticultural enterprises. Indeed the

majority of annual horticulture in the region now exists on these soils despite the poor fertility. The horticultural industry has developed techniques to capitalise on the well-drained nature of these soils although there are considerable ongoing problems associated with nutrient leaching from fertilisers.

Spearwood Dune System

Running adjacent to the Bassendean Dune System, the Spearwood Dune System consists of yellowish brown siliceous sands overlying limestone at various depths. The dunes are generally more hilly and elevated than the Bassendean dunes. A series of swamps and lakes often marks the divide between the two systems. Areas of flat to gently undulating terrain overlying marine limestone are also included in the Spearwood Dunes system. These areas are associated with lakes such as Lake Clifton.

Spearwood soils have good phosphorus holding capacity but poor nitrogen retention capacity. The agricultural potential in this system is moderate and represents the most productive soils for annual horticulture in the region. The Spearwood dunes also coincide with the diminishing and limited region that has a suitable microclimate for fresh annual horticultural produce within close proximity to the Perth and export markets.

These soils also coincide with adequate volumes of fresh water for horticulture and lucerne hay production. The majority of our carrot export market is supplied from these sandy soils.

Quindalup Dune Systems

The present day coastline consisting of unconsolidated aeolian or wind blown deposits is referred to as the Quindalup Dune System. These are the most recently formed dunes on the Swan Coastal Plain.

The major landforms are the coastal dunes with gentle seaward slopes and steep slopes facing east. In most cases the dunes are resting on limestone from the Spearwood Dune System. The soils are considered unproductive for agriculture.

Another landform associated with the Quindalup Dune System is the 'Vasse estuarine and lagoonal deposits'. These areas are low-lying poorly drained terraces with flat and beach ridges. They border the Peel Harvey estuarine systems, coastal lakes and major river outlets. The soils are variable, being formed on unconsolidated estuarine alluvium lagoonal deposits. They are often highly saline and subject to inundation.

Current Trends, Issues and Associated Management Response

Land Degradation / Eutrophication

The erosion of nutrients in solution or attached to soil particles is now recognised as a form of land degradation. It is the most significant form of land degradation in the area due to the impact on sensitive waterbodies that are down-stream of agricultural and urban areas.

The close association with erosion means that methods associated with erosion control are effective in reducing nutrient movement. The main control method is stabilisation of the area near watercourses by fencing and revegetating. The poor nutrient retention of sandy soils can also be enhanced by soil amendment.

Acidification

The decrease in soil pH is serious land management issue in the coastal catchment and occurs over all agricultural industries. This acidification is caused by the leaching of the breakdown products of ammonium compounds either applied as nitrogenous fertilisers or from legumes. The pH buffering capacity of most of the soils in the region is high and this often results in a greater than expected requirement for crushed limestone.

Although the Spearwood sands are generally initially alkaline, they often require applications of lime for continuing horticultural use. The close proximity of good quality lime supplied from coastal marine deposits makes liming relatively cheap and effective.

Non-Wetting Soils

Soils referred to as 'non-wetting' are repellent to water because of waxy organic compounds coating the soil particles. Water beads on the surface and runs off before the moisture has a chance to infiltrate into the profile, leaving the subsurface dry even after heavy rain. It is most notable in autumn, with decreases during winter, as reliable high rainfall saturate the soil profile. The effect is an uneven wetting pattern affecting seed germination. The main problem associated with water repellence is uneven germination of annual pastures.

Water repellence is associated with coarse textured sandy soils with low clay content (generally less than 5 per cent). Susceptible soils are *pale deep sands* and *grey deep sandy duplexes*. These soils are common on the Pinjarra Sandplain and dune systems, but particularly a problem for agriculture on the Bassendean Dune System.

The main management option is the use of perennial species that have such extensive root systems that they explore the wet areas of the preferred pathways where the water flow is concentrated. These perennials have the other advantage of being more efficient water and

nutrient users and provide much greater protection to the soil than annual pastures.

Applications of fine particle soil amendments such as clay or bauxite residue can reduce water repellence, increase water holding capacity and increase nutrient retention. Indeed the modification of the structure of sandy soil can result in a soil of higher productivity than the heavier clays because of the well-drained nature of the sands and the close association with groundwater suitable for irrigation.

Wind erosion

A combination of strong winds, loose dry soils and lack of vegetative cover create a susceptibility to wind erosion. Erosion is a natural process and deposition plays an important role in soil formation. However mismanagement such as over-stocking and use of inappropriate cropping techniques can accelerate the process, especially during drought. Wind erosion results in the loss of topsoil and associated nutrients. Additionally damage to crops through sandblasting and atmospheric pollution are also concerns.

Any loose soil with a dry and exposed surface is prone to wind erosion, however some soils such as *pale deep sands* and *grey sandy duplexes* and landforms such as dunes are particularly susceptible. The result is that the Pinjarra Sandplain and dune systems on the Swan Coastal Plain are particularly vulnerable.

Management of wind erosion involves minimal disturbance and establishment or maintenance of protective cover. The main management technique in a region with such small property sizes is to provide wind breaks, these also have the benefit of providing shelter from both winter and summer wind for livestock. Appropriate stocking rates and maintaining adequate ground cover will reduce disturbance. This could include the use of perennial pastures and rotation of stock. In a cropping situation (rare) disturbance can be reduced by the use of minimal tillage cropping techniques and stubble retention. Use of soil amendments such as clay can be of value to reduce wind erosion by increasing the cohesion of the soil and improving plant growth.

Salinity

There is both dryland salinity and irrigation induced salinity in the region. Both occur mainly in the east on the heavier soils that have most clay. Salinity affects 20% of the Swan Coastal Plain and 36% of the irrigation area. The dryland salinity has resulted from a combination of high salt level in the rainfall and poor drainage resulting in waterlogged soils which exacerbates high salinity.

The irrigation-induced salinity occurs in areas where salts in the irrigation water have added to the existing salts at the same time as an irrigation water induced rise in the water table. Particularly in the

southern parts of the irrigation area which receive irrigation water with higher salts. The result is similar to other areas where high water tables combine with saline conditions to reduce plant growth.

The major techniques for combating salinity in the region are the drainage of the saline water and the more efficient application of irrigation water. Subsurface drainage is showing particular promise in the heavier clay areas. Mapping of the saline areas is proceeding and is expected to assist in more efficiently targeting resources to combat salinity.

Ch. 9 CURRENT NRM VOLUNTEER CONTRIBUTION

Current Status

The Peel-Harvey Catchment enjoys the support and efforts of a significant number of NRM groups. These groups are working in NRM sectors such as coast and river care, urban and rural landcare and education and awareness raising. Across the region there are more than 30 groups run by volunteers and supported by landcare officers and government representatives.

Community work is becoming increasingly valued as an essential component in large scale environmental improvement. It is widely acknowledged that significant and continued funding is required for long term rehabilitation and management to achieve sustainability.

Community knowledge and involvement is also becoming increasingly recognised as a valued part of the decision making process. Community people are often the first to notice changes in their surrounding natural environment as it relates so closely to their day to day activities. Their practical experience and knowledge can combine with scientific and technical experience to create an effective, integrated catchment management partnership.

An involved community adds a good understanding the different social and economic pressures to decision making processes. Through it own processes and support/interaction with the community, Local Governments can make a significant contribution to Natural Resource Management.

Current Trends and Issues

The great majority of support for volunteers is now provided through National Heritage Trust funding. Additional support is provided to volunteer groups by the private sector and all levels of government.

The initial landcare movement inspired many landowners to undertake significant on-ground activities. While a core membership continues to drive action for many of the efforts in this area, there seems to be little evidence of any uptake by new members. There are a number of factors that could contribute to this including:

- increasing economic pressures on landowners. Some examples include pressures incorporating GST into businesses, Dairy Deregulation, lower return on traditional agricultural enterprises (e.g. beef, dairy) which form a significant part of the rural community. Even with some Government contribution, landowners still have to make a direct and ongoing contribution to environmental improvement works.

- Original participants had an understanding of the value of NRM over their land. To continue to promote the value of NRM, education needs to be focused toward increasing landowners understanding of, and commitment to, the NRM process.
- A lower profile for urban NRM through the limited recognition and support given to these groups.

Current Management Responses

The early beginnings of NRM were driven by intensive one to one government officer to landowner contact. The current focus has moved to the development and implementation of regional management strategies that have the potential for a greater impact on NRM outcomes in the Peel-Harvey catchment

As a response to this shift in focus, government agencies now assist NRM groups to apply for funds to support their activities while providing technical and on-ground support.

State government agencies are increasingly valuing the involvement of the community groups and Local Government with a number of successful partnerships evolving, including:

- Restoring SJ for Tomorrow
- Crossing the Boundaries
- The Dirk Brook Project
- Coastcare
- Ribbons of Blue

Options for Future Management

- Community knowledge and action in the Peel-Harvey currently makes a valuable contribution to Natural Resource Management. Effectively capturing and combining this knowledge and action with scientific and technical expertise would create a powerful and valuable decision making tool for the Peel-Harvey catchment.
- With a growing regional population, it is imperative that every effort be made to increase and support urban and rural NRM volunteers. There is a great opportunity the Peel-Harvey Catchment Council to increase the profile of NRM across the catchment and to partner into significant initiatives.
-
- There is a need to develop a better understanding of pressures on local communities and identify key social, economic, and environmental drivers inspiring natural resource management.

Ch. 10 POLICY AND PLANNING IN THE CATCHMENT

Current Status

Although policy and planning in the Peel-Harvey Catchment are relatively concurrent processes undertaken at both the State and Local Government levels they are addressed separately in this chapter in an attempt to achieve clarity of background and function.

State Policy Responses to Peel-Harvey Environmental Planning Issues

The development of the existing policy framework dealing with the nutrient/algal issues in the Peel-Harvey estuary and catchment had six key steps, which are discussed in detail in subsequent sections:

- pre 1985, developing management options and the Stage 1 ERMP - no firm policy position;
- 1985-87, Stage 1 ERMP advice - policy position was being firmed up;
- 1987, Stage 2 ERMP Environmental Conditions - the first statutory policy position established;
- 1987-1991, first phase of implementing the Stage 2 ERMP Environmental Conditions - partial policy vacuum;
- 1991-1994, a tripartite statutory policy framework - EPP, SPP and Environmental Conditions;
- 1994-present, the pressure for change - questioning the appropriateness of the existing policy positions (the tripartite statutory policy framework still in place).

Pre 1985 developing management options

The focus of the work during this period was on research and developing management options for the estuary and its catchment. The Environmental Protection Authority (EPA) and Department of Environmental Protection (DEP) carried out most of the early policy development work¹. The DEP in the 1970s and 1980s had a strong research emphasis, and co-ordinated and carried out much of the research in the estuary's problems (from 1978 to 1987, the DEP released 28 technical reports relating to aspects of the ecology and management of the estuary, the first being Hodgkin, 1978).

In 1976 the EPA asked its Estuarine and Marine Advisory Committee to investigate the problems of the Peel-Harvey Estuary. That Committee reported to the EPA in 1980 (Hodgkin, E. P., Birch, P. B., Black, R. E.

¹It is worth noting that the EPA and DEP have had various names and associations since the 1970s. The five-person board has always been called the EPA. The DEP (public servants) were first called the Department of Environmental Protection, then the Department of Conservation and Environment (DCE), with the new EP Act in 1987 both the five person board and the department went by the same name - the EPA, and finally in 1993 the department reverted to the name DEP. For convenience, the two agencies will be called by their existing names.

and Humphries, R. B., 1980), and suggested 9 options for management of the estuary.

In 1984 the DEP released a report titled “Management of the Peel Inlet and Harvey Estuary: report of research findings and options for management” (Department of Conservation and Environment, 1984), which was based on the Estuarine and Marine Advisory Committee work and its own research. The DEP’s “preferred strategy” had three key elements:

- weed harvesting;
- reducing phosphorus input into the estuary; and
- increasing loss of nutrient through greater flushing (construction of the Dawesville Channel).

Following the release of the DEP report the State Government established the Peel-Harvey Study Group (also in 1984). This group co-ordinated the development of management options for the estuary and developed draft management objectives and management options (Peel-Harvey Study Group, 1985).

This report and the 1984 DEP report formed the basis for Stage 1 of an Environmental Review and Management Programme (ERMP). The government nominated the Departments of Agriculture and Marine and Harbours to be the lead agencies in the management of the estuary and its catchment, and to be the proponents for the ERMP. The ERMP was in two parts: Stage 1 examined the broad management options and overall strategy whereas Stage 2 looked at the more detailed management implications of the agreed strategy.

The EPA released its report on the Stage 1 in 1985, which was the start of the next phase of the policy development in the catchment.

1985-1987 - Firming up the Policy Position

The EPA’s report on Stage 1 ERMP largely endorsed the DEP’s “preferred strategy” but also recommended that more detailed work needed to be done as part of a Stage 2 ERMP (Environmental Protection Authority, 1985). At that time the Environmental Protection Act had only limited powers and so the recommendations from the Stage 1 ERMP did not lead to statutory mechanisms to control and manage the catchment.

The development of the Stage 2 ERMP was carried out at the same time the Environmental Protection Act was being amended to increase the statutory powers of both the Minister for the Environment and the EPA. These changes came into effect in 1986, which meant that the EPA assessment was carried out using these increased powers. The EPA assessment of Stage 2 (Environmental Protection Authority, 1987b. is the third stage of policy development.

1987, Stage 2 ERMP Environmental Conditions

In reporting on the Stage 2 ERMP the EPA made 13 recommendations for action, with the main elements being:

- controls on phosphorus usage be adopted including the development of an integrated catchment management plan;
- an Environmental Protection Policy be prepared;
- no new clearing and draining be allowed;
- controls on human effluent be implemented;
- weed harvest continue;
- the Dawesville Channel be constructed and managed appropriately;
- the Peel-Harvey Regional Park be implemented;
- decisions on new developments in the catchment be conservative; and
- mosquito control measures be implemented.

These recommendations formed the basis for 13 statutory environmental conditions, with the Ministers for Agriculture, Transport and Waterways nominated as proponents.

There was considerable optimism in some sections of government that this approach of having legally binding conditions set on Ministers of the Crown would lead to co-ordinated management of the estuary and its catchment. The approach is certainly innovative and, arguably, reflects the growing importance of environmental matters - there would be few governments in the world that would allow Ministers of the Crown to be subservient to the Minister for the Environment outside of some Cabinet hierarchy. It is also true that considerable progress was made in subsequent years in repairing the health of the estuary (refer to other chapters). However, from a policy perspective some problems emerged very soon after the gazettal of the environmental conditions, which lead to a partial policy vacuum until 1991.

1987-1991, First Phase of Implementing the Stage 2 ERMP Environmental Conditions

Whilst the Environmental Conditions provides the first statutory basis for management in the catchment, the interpretation of one condition - Condition 9 (see below)- lead to significant delays in the planning approval system.

Three key areas of catchment management were covered by the Environmental Conditions: repair, on-going management of existing activities in the catchment, and managing new proposals.

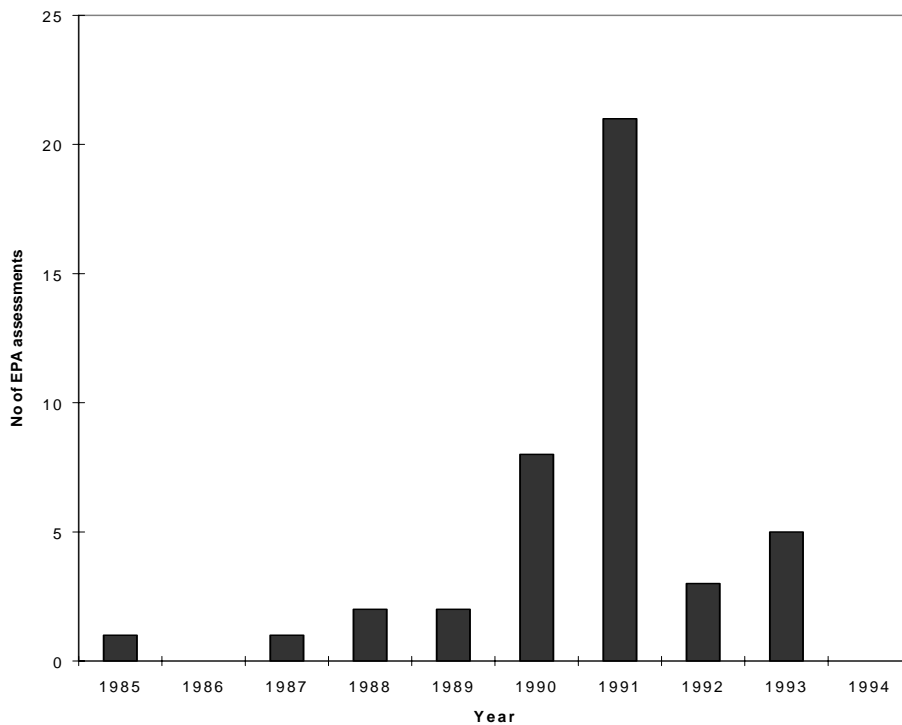
The key elements of the repair side of management related to weed harvesting and the construction of the Dawesville channel, which have been implemented largely as proposed. The key elements of on-going management of the catchment have been progressively implemented, although a consolidated integrated catchment management plan had not

been produced (Condition 4). The Condition requiring the development of the Environmental Protection Policy (Condition 3) is part of on going management package and was finalised in 1992(refer below).

The Environmental Condition which related to managing new developments (Condition 9, decisions on new developments in the catchment be conservative) created the problems which lead to the partial policy vacuum. This vacuum lasted until 1991.

This condition was interpreted to mean that all new developments should be referred to the EPA for environmental impact assessment (EIA). This lead to a significant increase in the workload for both the EPA and DEP. Figure 1 shows the number of reports released by the EPA which relate to proposals in the Peel-Harvey catchment in the nine year period just before and after the release of the EPA’s report on Stage 2

Figure 10.1: The number of EPA assessments in the Peel-Harvey from 1985-1994.



ERMP.

Two interesting points emerge from this data. Firstly, Figure 10.1 clearly shows that the number of Peel-Harvey EIAs substantially increased following the release of the EPA’s report on the Stage 2 ERMP with most reports released in 1990 and 1991. Secondly, following 1991, the number of Peel-Harvey assessment dropped significantly.

The reason for the drop in Peel-Harvey EIAs following 1991 relates to the changing role of the key planning agency - the (then) State Planning Commission (SPC) - in the catchment. The requirement that all new

proposal be referred to the EPA was recognition that new developments, if not carefully managed, could pose a significant threat to the estuary. It had the indirect effect of getting the SPC caught up in catchment management.

The SPC had not had a significant role in the management of the estuary, the key agencies being Marine and Harbours (now Department of Transport), Agriculture and Waterways Commission (now Peel Inlet Management Authority and the Water and Rivers Commission).

It soon became clear that the requirement to refer all new proposals to the EPA was leading to significant delays in the planning system. The only way to solve this problem was to introduce a more strategic approach, which would allow the EPA to have a reduced role.

The response was to develop a Statement of Planning Policy (SPP) (Western Australian Government, 1992). The SPP incorporated the objectives of the EPP being developed at the time as well as the key management measures describe in the EPA assessments on the Peel-Harvey EIAs. A draft SPP was published in 1991 and finalised in 1992. It was developed with significant input from the key government agencies, most notably the DEP. The development of the SPP meant that the SPC and local government could deal with some new developments in the catchment without referral to the EPA.

To get around the referral requirement of Condition 9, a 14th Environmental Condition was added in 1991 which allowed any new proposals consistent with the draft, and later final, SPP to proceed without referral to the EPA.

This growing awareness of the relationship of the environmental and planning processes also spilled over to the EPP being developed at the time.

EPPs are developed under Part III of the Environmental Protection Act. Once proglumated, an EPP has the force of law and is binding on State and Local Governments, and affected individuals.

The Peel-Harvey EPP had three key elements:

- ascribing beneficial uses for the estuary,
- setting targets for phosphorus loads entering the estuary, and
- establishing a broad management framework.

The EPP came in to effect in 1992. The EPP, the SPP and the Environmental Conditions form the basis of the policy framework for the management of the estuary and the catchment, which are still in force to day. This tripartite framework went largely unchallenged until around 1994.

1991-1994, A Tripartite Statutory Policy Framework

The EPP, the SPP and the Environmental Conditions seemed to cover all the policy bases. The Environmental Conditions set management constraints on the key government Ministers and their departments. The SPP set environmental rules for new developments and the EPP set the broad management framework, which would apply, to all stakeholders.

The EPP and SPP relationship seemed to be particularly significant. The planning agencies often argue that the environmental agencies should not get involved in setting land use controls, either through the environmental conditions setting process or through EPPs. The EPP/SPP model in the Peel-Harvey overcame these difficulties. The EPP set broad environmental objectives and was a legally binding document. The SPP set land use controls, which were designed to meet the environmental objectives set in the EPP. Further, the SPP has limited statutory powers, but the EPP, in making reference to planning policies, gave a higher level of statutory authority to the SPP.

Current Trends and Issues

1994- Present, The Pressure for Change

By the mid 1990's, however, many people in the government agencies dealing with managing the catchment began to question the existing arrangements, particularly the relevance of the Environmental Conditions and the targets set in the EPP.

There have been several attempts to co-ordinate State and Local Government actions in the catchment since 1987. In 1991 a Government Officer Technical Advisory Group [GOTAG] was established, chaired by the Department of Agriculture. This group met for several years but then disbanded. The, then, Waterways Commission established both a Senior Officers Group (SOG) and a Technical Officers Group to better co-ordinate Government action in the catchment. The main departments represented on the SOG were the Waterways Commission, Marine and Harbours and the Department of Agriculture. One of its aims was to co-ordinate actions during the planning and construction of the Dawesville Channel. These groups were established around 1993 and took over many of the roles of the original GOTAG.

Some significant changes occurred within the DEP at this time as well. The work on the Peel-Harvey within the DEP was carried out by the Estuarine Branch. Certain decisions were made by management of the DEP which lead to the disbandment of that branch in 1993 and the resources re-allocated. The DEP's role in the management of the Peel-Harvey reduced significantly following the closure of that Branch. DEP main involvement following that time was through the assessment of new proposals.

The SOG began a review of management arrangements in the Peel-Harvey and concluded that a review of the Environmental Conditions was appropriate. It was the view of the SOG that many of the Environmental Conditions had been met and were no longer relevant. There was also a view that the targets set in the EPP were too narrow and that focusing only on phosphorus was no longer appropriate.

Current Management Responses

Clearly, there was a growing view in certain government departments that the existing policy framework requiring changing. Certain events followed which related to the review.

In December 1993 the SOG submitted a formal request to the Minister for the Environment to have the Environmental Conditions changed (under Section 46 of the Environmental Protection Act). The Minister for the Environment requested that the EPA provide advice on the request.

Officers of the DEP worked with the SOG to determine an appropriate community consultation process to facilitate the review. It was agreed that a supporting document was needed which provided and update on progress being made in meeting the requirements of the Environmental Conditions, and that this document be sent out for public review.

In July 1994 the EPA released a public discussion paper which contained the SOG's supporting document and a background report produced by officers of the DEP. Four weeks was allowed for public comment. Progress has been slow since that time. The EPA formally considered the request in 1998 but decided to refer the matter to an *ad hoc* special advisory committee, which was to provide specialist advice. The EPA has yet to receive the advice from that committee.

The EPP is also under review. The Environmental Protection Act requires that EPPs need to be reviewed every seven years. For the Peel-Harvey EPP the review was required by December 11th 1999.

In November 1999 the EPA released a report setting out how the EPP should be reviewed and calling for public submissions. In that report the EPA proposed that the EPP should be "rolled-over" unchanged until the EPA completes its review of the Environmental Conditions. The Minister for the Environment accepted this advice.

The SPP has not been reviewed since 1992, and it would seem logical that if two arms of the tripartite policy framework are to be reviewed then the third arm should also be reviewed

Options for Future Management

- The existing tripartite policy framework has taken many years to evolve and has been in place since 1991. Whilst many positive changes have occurred within the catchment since the time the framework has been in place, the relevance of that framework needs to be re-considered. This discussion paper should stimulate interest and further debate about the relevance of the existing tripartite policy framework.

Local Government Planning Processes

Current Status

Statutory planning control is administered under the Town Planning and Development Act 1923 (As Amended). Under the Act, Local Government Authorities are required to prepare Town Planning Schemes to provide zoning and land use planning control across the districts. This achieved through the zoning of land and listing permitted uses which can be carried out under each of these zones. Public uses are also reserved for particular purposes in Schemes including Parks and Recreation; Major Roads; Local Roads; Public Utilities; Railway Purposes, State Forrest and Waterways.

Local Authorities can also prepare planning policies in respect of any matter related to the planning and development of a scheme area, and adopted policies shall be consistent with the Town Planning Scheme. For rural areas experiencing the pressure for development, the West Australian Planning Commission (WAPC) has also required Local Authorities prepare Local Rural Strategies in accordance with the Commissions' Rural Land Use Planning Policy (DC3.4), which provides a mechanism for rational decision making for the future zoning, subdivision, strata titling and development of Rural land.

In February 1992 a Statement of Planning Policy N02 for the Peel-Harvey Coastal Plain Catchment was prepared under Section 5AA of the Act by the WAPC. This policy recognised the requirements of the Minister for the Environment, in consultation with the Minister for Planning, to ensure that land use changes within the Peel-Harvey estuarine system likely to cause environmental damage to the estuary were brought under planning control.

The objectives of this policy are:

- To improve the social, economic, aesthetic and recreational potential of the Peel-Harvey Coastal Plain Catchment.
- To ensure that changes to land use within the Catchment to the Peel-Harvey Estuarine System are controlled so as to avoid and minimise environmental damage.
- To balance environmental protection with the economic viability of the primary sector.
- To increase high water-using vegetation cover within the Peel-Harvey Coastal Plain Catchment.
- To reflect the environmental objectives in the Draft Environmental Protection Policy (Peel-Harvey Estuarine System) 1992.
- To prevent land uses likely to result in excessive nutrient export into the drainage system.

The policy applies to all residential, commercial, industrial, rural and recreational land uses, and other public sector undertakings within the boundary of the Peel-Harvey Coastal Plain Catchment. The catchment boundary takes in five metropolitan Local Authorities including Cockburn, Kwinana, Rockingham, Armadale and Serpentine-Jarradale, as well as the City of Mandurah and the Shires of Waroona and Harvey.

Current Trends and Issues

Several Local Authorities have introduced model scheme text provisions into their scheme to refer to the SPP No 2 provisions, particularly the need for development approval to be obtained for intensive agricultural development proposals. The Shire of Serpentine-Jarradale has gone one step further by preparing separate nutrient management guidelines as a means of interpreting the State Government policy initiatives at a local planning level.

For many development proposals in the Peel-Harvey catchment, it is necessary to refer the application to the Department of Environmental Protection, the Waters and Rivers Commission and Agriculture WA, before final determination. A major component of the SPP No 2 requires proponents to ensure that proposed changes to land uses and zonings take account of land capability/sustainability criteria with regard to the nett effect that such changes are likely to have on the nutrient load discharging from the catchment into the Peel-Harvey estuarine system.

The Planning Legislation Amendment Act 1996, introduced changes to the planning process to bring the planning and environmental assessment procedures together at an early stage so that they are better integrated. This legislation provides for statutory plans to be subject to formal environmental by the Environmental Protection Authority. Local Government is now required to notify the Environmental Protection Authority about its intention to prepare or amend a scheme so that the Environmental Protection Authority can determine if an environmental assessment is needed. The Town Planning Regulations 1967 have also been amended to prescribe the statutory procedures of Local Government scheme and amendment preparations.

Current Management Responses

In discussions with other Local Government Authorities there is a common view that the Planning Amendment Act 1996 and the inherent merging of planning and environmental legislation has in fact complicated the planning process not simplified it. In July 2000 a meeting took place at the Shire of Serpentine-Jarradale involving Local and State Government officer representatives to discuss planning processes in the Peel-Harvey catchment. The current list of activities requiring planning approval in the catchment were discussed, along with suggested improvements in the decision making process. Department of Environmental Protection (DEP) officers acknowledged that the referral process was becoming unworkable due to the lack of resources to deal with the heavy workload. Under the Environmental Protection Act any

proposal with a significant impact on the environment needs to be referred and it is the DEPs' intention in the future not to deal with the minor proposals, only the ones having a significant impact. Before this occurs, a protocol needs to be developed on how this referral system is to operate.

Options for Future Management

A range of different measures listed below, have been discussed at various public workshop forums for improving the current processes.

- Information packages and guidelines for proponents of development proposals to be prepared for dissemination by Local Government.
- A code of practice to be developed between Local Government and the Department of Environmental Protection in referral of significant development proposals, and guidelines for dealing with non-significant proposals.
- A better standard of applications being submitted, and this is linked back to information packages for applicants to address the various issues.
- Land capability mapping and GIS data for natural Resource Management should be made available for use by Local Government Authorities. This matter is to be taken up separately through the Country Shire Councils Association to bring to the attention of the State Government the need for greater resource sharing in natural resource management information and data.
- The need for better co-ordination of NRM information and integration in the planning decision making processes.
- Apart from the Shire of Serpentine-Jarradale, other Peel-Harvey Local Government Authorities are under resourced to deal with environmental and catchment management issues. Appointment of environmental officers in each Local Authority would assist in this area.
- Checklists of information to be addressed by proponents to be prepared by Local Governments and State Government agencies.
- Review of the planning and environmental legislation as well as the SPP No 2. Some political weight and input would to lobby the Government to review the workings of the legislation. The recent formation of the Peel Planners Group consisting of the senior planners from the various Peel Local Government Authorities provides a good forum to network ideas, integrate policies and guidelines, share resources and communicate with elected representatives, ratepayers, community groups and consultants on the various problems and issues facing the Peel Region.

- Establishment of a Regional Planning Committee that has decision making powers on statutory and strategic planning matters which is to be based in the Peel Region, including representatives from Local Government Authorities.
- Model Scheme Text provisions being introduced into new Town Planning Schemes to provide greater consistency in general planning provisions across all Peel Local Government Authorities.
- Local Government to prepare a local planning strategy that sets out Councils broad vision for the longer term directions for land use and development and integrate the current separate local Rural, Settlement and Commercial Strategies into one document.
- Local Government to consider participating in Local Agenda 21 or ecologically sustainable development program and partnerships between Government, industry and community groups.

It is important to keep in mind the community perspective in the planning process and an appropriate outcome in improving these statutory processes will be to provide a better level of service delivery to the general community. It should not go unnoticed that nearly every community forum that has been arranged in the Peel Region over the last five years has highlighted the need for better decision making in land use planning and for more effective communication and partnerships involving all levels of Government to achieve the lifestyle results which the community is seeking.

Ch. 11 INTEGRATED CATCHMENT MANAGEMENT IN THE PEEL-HARVEY

Current Status

Current integration between agencies relies solely on a co-operative approach from the Officers on the ground, but up until the formation of the Peel-Harvey Officer's Group there was no current structure to encourage this. There have been a variety of structures in the past, but few now remain operational.

With the formation of the Officer's Group and the Catchment Council we now have the opportunity for better communication, understanding, knowledge and effective decision making. Further thought and planning needs to go into how this process can operate effectively on a long term basis.

Various projects exist within the catchment, for example Crossing the Boundaries and the Dirk Brook project, where different agencies work together. These need to be evaluated to determine if the different agencies and organisations in these projects are integrating well or operating in a more compartmentalised style. Getting everyone from different organisations in one room is a good start, but processes need to be established to ensure good integration, planning and on-ground outcomes.

Currently, resources are being inefficiently expended due to difficulties in reaching an understanding on common catchment goals, common research aims and data collection methods throughout the catchment.

There is an enormous amount of research which has been conducted in the Peel-Harvey Catchment, however it is not always easily available or transferable to other data sets. The Peel Center for Water Excellence is playing a key role in collating and assessing this data for future use.

Current Trends and Issues

- National Framework for Natural Resource Management, this document indicates that funding for natural resource management (NRM) should be decided on the basis of how well projects or organisations are strategically aligned with Regional NRM plans (this would be the South West Catchments Council Regional Strategy for the Peel-Harvey).
- There is an overall trend in declining resources available for Natural Resource Management from traditional sources. For example the Natural Heritage Trust has recently announced it will only be funding one more year's worth of projects. NHT are a significant source of

funding for the high level of on-ground environmental repair works that take place each year.

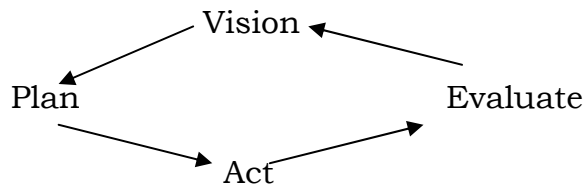
- There are significant opportunities for funding for direct on-ground works, but often these funding sources require a strategic plan to be in place already and do not allocate resources for project management (ie is deemed the responsibility of the community volunteers). A regional Catchment Plan would significantly increase the opportunity for smaller groups to implement this type of funding.
- There are significant opportunities for corporate sponsorship, but groups need to be able to show a good structure and exactly where the funds will go (*Alcoa of Australia* are a fantastic example of a successful partnership between the corporate and community sectors in the Peel-Harvey). Businesses generally prefer to deal with larger organisations and the Peel-Harvey Catchment Council is well situated to take on this role.
- Increasing community awareness of environmental issues and an increasing understanding of the benefits in having an overarching body, which can act as a communication center for discussion and planning for the Peel-Harvey environment.
-
- Increasing demands on Local Government means there is an opportunity for the Peel-Harvey Catchment Council to provide some support by developing strategies for environmental improvement that can be easily implemented by Local Government, with the assistance of the Peel-Harvey Officer's Group.
- Many natural resource management issues have common base causes and a regional policy and planning perspective should help to generate efficiencies in dealing with these causes. With greater input and integration from a number of NRM organisations and the community, hopefully the policies will be more effective and more easily implemented.

Current Management Responses

The history of integrated catchment management (ICM) in the Peel-Harvey is an interesting story and many references cover the topic.

ICM has been supported by government almost to the point of forcing the issue, but it has taken a long period of time for the community to fully understand and see the relevance and benefits of this approach. Since this occurred however, a dedicated approach to developing an effective ICM system has been under taken by the PHCC.

Options for Future Management



The Peel-Harvey Catchment Council has already developed a vision, which is “People Working Together for a Healthy Environment”. The next step is to determine how we can do this and develop an action plan to implement it.

Step One – Developing a Good Plan

The first step in the overall development of effective Integrated Catchment Management requires the preparation of an ICM issues plan. The issues plan and feed back from it, are then used to develop a catchment plan, which must capture all the NRM issues that are currently being worked on and those that are not being addressed. Everyone interested in natural resource management should be able to look at this plan and see their issue.

It is essential that this document contains the very real issues that are faced by different organisations. It should not be a glossy document saying that everything is wonderful, but deal with the real issues we are facing in the catchment and propose options for addressing these issues in an integrated manner.

We need a very good system of determining priorities for the catchment, which should be able to encompass social, economic and environmental values.

Step Two – Commitment and Action

Commitment must be gained from NRM Agencies, Shires and environmental organisations to the Plan and its implementation.

It is an ambitious, but achievable goal for NRM agencies (and those agencies whose core business depends on effective natural resource management) and community organisations to get to the stage where they design regional projects and budget submissions for the year’s activities, which specifically address the Peel-Harvey Catchment Plan. Clear partnerships would spell out roles and responsibilities for action.

Step Three – A Common Language

We need an effective process of information collection, evaluation and transfer for all NRM organisations in the catchment to truly work as an integrated system. We must develop a common language when it comes to the issues we are dealing with.

Currently there are several different methods use to collect and analyse the physical, chemical and biological status of the catchment. As a catchment we are not efficiently using the resources that we spend on data collection, evaluation and interpretation. This is a critical process that we must improve as a priority.

There is a of potential to use the Center for Water Excellence as a tool for information management in the catchment. Peel SISTEM will also be an excellent tool for gaining a broader understanding of the social, economic and environmental information that we will require.

Step Four – How Do You Know If You’re Winning?

We need to dedicate resources to ensure an environmental reporting system would allow effective evaluation to be made of how the catchment plan’s implementation impacts on priority issues.

Again, a good system needs to be implemented where people know what information they need to be collecting. The system used to evaluate the priorities in step one, could then be used to re-evaluate the priorities for the coming year and re-work the Catchment plan, if required.

Communication

We need to do two essential things to make an effective and relevant catchment plan:

- 1) Have a communication system which allows people to have input on catchment issues and actively seeks their opinions,
- 2) Communicate the plan widely and ensure all stakeholders are aware and actively involved in it.

We also need to communicate the plan to the “key stakeholders” of our “key stakeholders”. For example, ensuring that the Executive of each NRM Agency is aware of the priorities for the Peel-Harvey should hopefully assist the facilitation of budgetary proposals put up by the Peel-Harvey region of the particular Agency. This will be an important lobbying role of the Peel-Harvey Catchment Council.

It is important that we have good links with the South West Catchments Council to ensure that they are able to carry our issues forward at a state and national level.

There are 3 major goals that we could aim for to have an effective Integrated Catchment Management process in place:

- A catchment management plan with prioritised issues from all stakeholders in the catchment. This will be a leading document, which all decision-makers can refer to.

- NRM agencies, local government and other key organisations formally commit to the process and develop integrated strategies for each party to implement. They use the catchment management plan for the Peel-Harvey to actively design their projects and budgets around. A meeting of Project Managers and Officers in the Peel-Harvey could take place around April/May to discuss and design the different needs of each Agency and Shire with respect to the needs outlined in the catchment plan. In practice, this means they would operate as a large NRM agency (State and Local Government, and Environmental Organisations) to design integrated projects which should meet the goals of their organisation, but are also specifically tailored to the priorities of the catchment. The result of this system should be that we have a better integrated approach by all organisations, faster results as we all work together to address issues, the reduction in duplication of effort, and an increase in community participation as their priority concerns are addressed in an integrated manner.
- An effective “day-to-day” communication system, both within and between the Officer’s Group and the Peel-Harvey Catchment Council. This should facilitate better decision making on issues, which may not be significant enough to include in an annual catchment plan or are “one-off” unexpected issues that require an integrated reactive response from natural resource managers in the Peel-Harvey. This will also over time increase the openness and co-operation of Officer’s from different organisations in the Peel-Harvey.

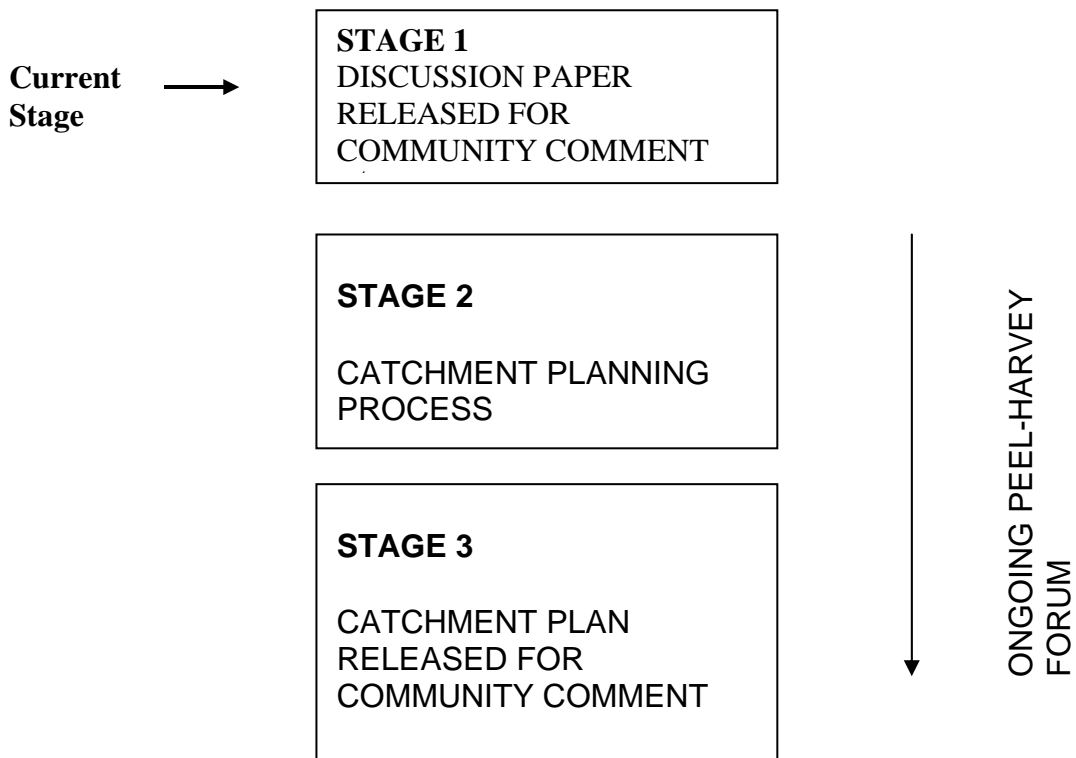
Ch. 12 CONSULTATION PROCESS FROM HERE

The Peel-Harvey Catchment Council is initiating a process of catchment planning, for both the short and long-term future of our natural resources. This Discussion Paper is the first step in that process and aims to capture the breadth of regional issues that need to be incorporated into the Catchment Plan, provide a brief current status report and propose potential options for the future management of natural resources.

This document has captured community and scientific input at the beginning of the catchment planning process. If the best possible information is captured at the start, the result will be the best possible Catchment Plan at the time of its preparation.

It is important to make sure everyone's issues are heard and incorporated to make sure we develop a plan that we can all work toward. The following consultation process is therefore proposed.

Proposed Consultation Process



Consultation Process

Stage 1: Discussion Paper Released for Community Comment

Following the release of the Discussion Paper on December 1st, there will be a three-month comment period. Copies of the Discussion Paper will be sent to all people who are part of the natural resource management community in the Peel-Harvey.

A critical part of the feedback we are seeking is your opinion on the priority issues for the Peel-Harvey catchment, summarised in the previous chapter.

However, you are encouraged to comment on any of the following:

- those issues that you are most passionate about;
- all of the issues; or
- the broad topic of the future direction of natural resource management in the Peel-Harvey.

Possible headings you may like to use for your response are:

- Accuracy of the summary of issues.
- Opinion of the proposed management options and any suggestions.
- Opinion of the priorities for the Peel-Harvey Catchment.
- Suitability of the proposed consultation process and timeframe.
- Other feedback or issues.

Stage 2: Catchment Planning Process

Upon receipt and assessment of the feedback on the discussion paper in March 2001, the Peel-Harvey Catchment Council and the Peel-Harvey Officers' Group will commence a catchment planning process.

Regular updates will be held for the community through a Peel-Harvey Forum on progress throughout the year and to seek feedback on direction and priority issues.

Stage 3: Catchment Plan Released for Community Comment

The resulting document will be released for formal comment.

Bibliography

- Bradby Keith, Peel-Harvey, The Decline and Rescue of an Ecosystem. Greening the Catchment Task Force (Inc) 1997
- Department of Conservation and Environment, 1984. Management of the Peel Inlet and Harvey Estuary: report of research findings and options for management. Bulletin 170, May 1984.
- Environmental Protection Act 1996 (As Amended)
- Environmental Protection Authority, 1985. Peel Inlet and Harvey Estuary Management Strategy; Report and recommendations by the Environmental Protection Authority Assessment report Stage 1 ERMP. Department of Conservation and Environment, Bulletin 243. December 1985.
- Environmental Protection Authority, 1987b. Peel Inlet and Harvey Estuary management Strategy Environmental Review and Management Programme Stage 2. Report and recommendations of the Environmental Protection Authority. Bulletin 363, November 1988.
- Environmental Protection Authority, 1998. Shire of Murray Town Planning Scheme No 4 Amendment No 104 (Point Grey). Shire of Murray. Report and recommendations of the Environmental Protection Authority. Bulletin 899, June 1998.
- Fisheries WA., (2000), Management Directions for Western Australia's Recreational Fisheries, Fisheries Management
- Hodgkin, E.P., Birch, P. B., Black, R. E. and Humphries, R. B., 1980. The Peel-Harvey Estuarine System Study (1976-1980). Department of Conservation and Environment, report No 9.
- McComb and Lukatelich, *The Peel Harvey Estuarine System, Western Australia*, Institute for Environmental Science, Murdoch University, unpublished paper.
- Model Scheme Text. Western Australian Planning Commission
- Oma et al. (1992) Coastal Rehabilitation Manual, Agriculture Western Australia.
- Peel Development Commission (1997), Labour Market Analysis. Peel-Harvey Study Group, 1985.
- Peel Inlet and Harvey Estuary Management Strategy - Environmental Review and Management Programme Stage 1.

Planning Legislation Amendment Act 1996 – Government Gazette
4/8/1996

Potter, I.C., de Lestang, S., and Young, G.C. (1998), *Influence of the Dawesville Channel on the recruitment, distribution and emigration of crustaceans and fish in the Peel-Harvey Estuary*, Fisheries Research and Development Corporation, Project 95/042.

Shire of Murray Town Planning Scheme No 4 Gazetted 23 June 1989

Summers, Rob, Research Officer, Agriculture Western Australia,
personal communication.

State Planning Strategy – Government Gazette November 1996

Town Planning and Development Act 1928 (As Amended)

Town planning Regulations (As Amended)

Water and Rivers Commission and Dept of Transport, Dawesville
Channel Monitoring Programme: Technical Review Report,
December 1998

Western Australian Planning Commission Act 1985 (As amended)

WRC, Water and Rivers Commission unpublished data.

WRC 1998, *Groundwater Allocation Plan: Murray Groundwater Area*,
Water and Rivers Commission WRAP 13, 1998.

WRC 1998, *Proposed Harvey Basin Surface Water Allocation Plan*, Water
and Rivers Commission WRAP 14, 1998.

WRC 1999, *Surface Water Hydrology of the Murray River Basin*, Water
and Rivers Commission, 1999.

WRC 2000, *Nutrients In Tributary Inflows To The Peel-Harvey Estuarine
System, Western Australia: Status And Trend*, Water and Rivers
Commission, Water Resource Technical Series No WRT 23.

Western Australian Government, 1992. Statement of Planning Policy No
2: The Peel-Harvey Coastal Plain Catchment