
RIVER RECOVERY PLAN
SECTION 10 — YORK

WATER AND RIVERS COMMISSION
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Preface

A key strategy developed by the Avon River Management Authority in the past three years has been to subdivide the main river (from the Yenyenning Lakes downstream to Avon Valley National Park) into 18 sections. This allows us to focus our resources on particular areas. It also provides opportunities for local communities to become closely involved in river management.

In 1996/97 recovery planning was completed for the first three of the river sections, and planned works are now under way. These sections were the Yenyenning Lakes, Section 6 (Northam) and Section 3 (Toodyay).

In early 1998 we turned to the next area on our list, Section 10. This is the stretch of river running downstream from East Gwambygine Road to Balladong Bridge. To this we have added part of Section 9, this being the section of the river running through York townsite, as it seemed to ARMA that these areas were inextricably linked. The combined sections are referred to in this plan as “York’s Avon River”.

Like the other river sections, York’s Avon River has a range of problems which need urgent attention. At the well-attended public meeting which ARMA called to kick off the recovery planning process, some 39 separate issues were listed which people wanted addressed in the plan. These ranged from nature conservation to urban issues.

York is fortunate in that there has been a strong community focus on the river for several years, thanks to the local River Conservation Society. This

Recovery Plan builds on river conservation work undertaken by RCS members since 1990.

This plan is timely in that its development coincides with a range of urban sewage and drainage works being undertaken by the Shire and Water Corporation, all of which will contribute to river recovery in the long term. I believe that the implementation of these projects together with this Recovery Plan, will provide a model for river management in Western Australia.

I would like to thank members of the York community who volunteered to work on an Advisory Committee to assist ARMA with this plan. These were: Wilf Caporn, Geoff Cockerton, Thekla Coton, Joyce Fleay, Rosie Fleay, Cicely Howell, Sir William Heseltine, Stephanie Iredell, Jim Kennison, Bob Lubout, Liz Manning, Shane Moad, Judy Monks, John Oliver, Keith Schekkerman, Stephen Skull and Peter Watts.

Roger Underwood was the planning consultant and facilitator for the project.

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1. Introduction

This River Recovery Plan focuses on the section of the Avon River which flows from the Gwambygine Bridge to the northern end of the York Townsite. This comprises Section 10 and part of Section 9 of the 18 river sections for which ARMA is developing a recovery process.

The focus river stretch is referred to in this plan as “York’s Avon River”. It is shown on maps 1 and 2.

1.1 Objectives of the plan

The objectives of the plan are to:

- establish a vision for the river, which is to be achieved by implementing this plan along with other urban and broader catchment management programs in York and surrounding districts;
- identify the key issues which need to be better managed to assist recovery of the river;
- develop practical local strategies which will guide recovery and rivercare action in and along York’s Avon River;
- rank actions, so as to help decision-making, budgeting and resource allocation; and
- describe how it is intended that the plan be implemented, including the on-going involvement of the York community in rivercare work.

An overall objective is for other agencies and organisations who have the capacity to influence the recovery of the river to endorse the completed plan, and to incorporate it into their own goals. The key organisation is the Water and Rivers Commission (ARMA’s “parent” agency). Others are the:

- Shire of York;
- River Conservation Society;
- Water Corporation;
- York LCDC and associated catchment groups;

- Westrail;
- York Tourist Bureau, and the Avon Ascent Committee;
- Aboriginal interests;
- Historical and heritage interests;
- Main Roads Western Australia;
- Avon Working Group of the Swan-Avon ICM;
- AGWEST; and
- York bushfire community/brigades.

1.2 Why a Recovery Plan is needed

Before, and in the early days of European settlement, York’s Avon River had superb natural physical and cultural values.

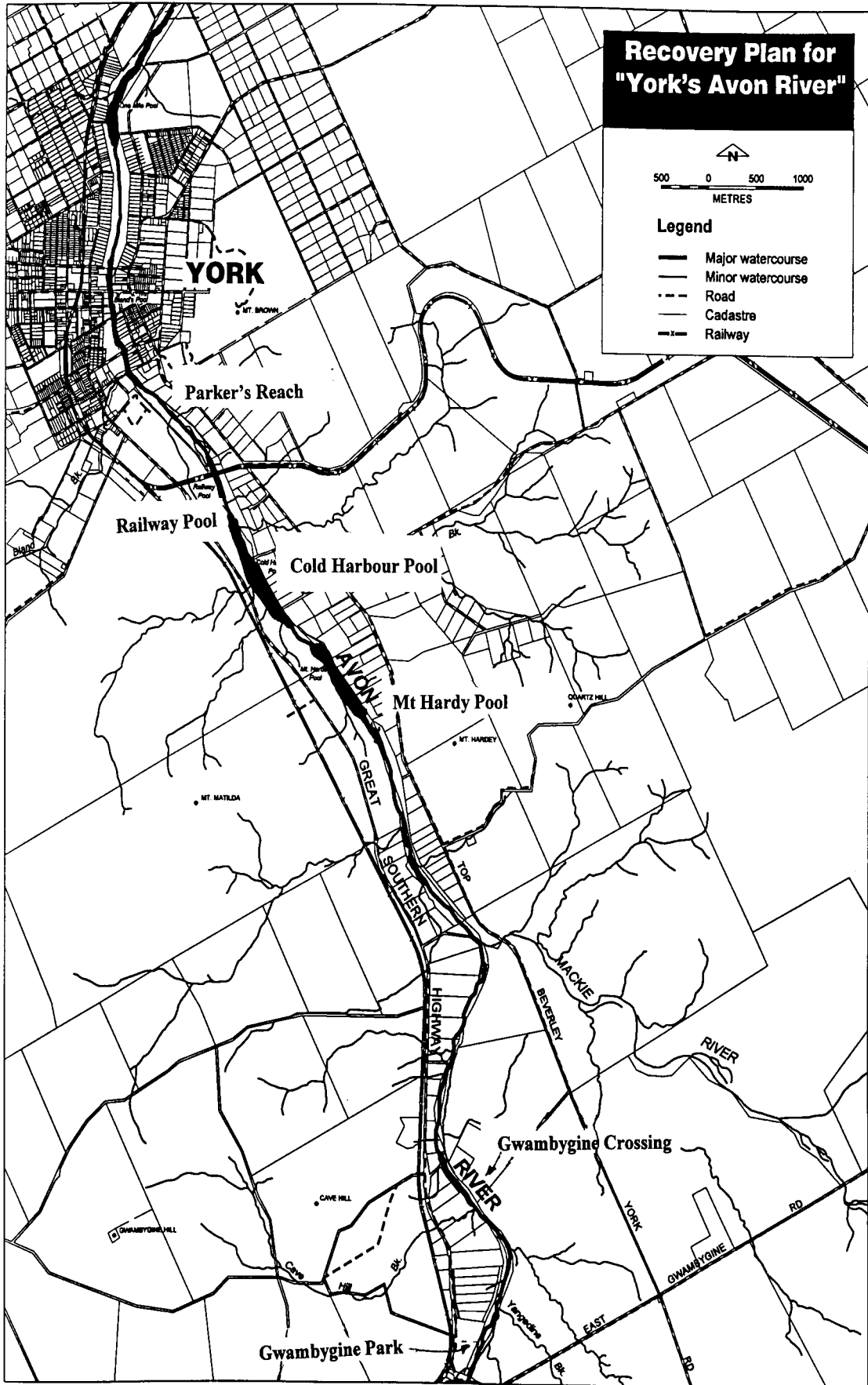
The main river channel was originally braided, with many small channels interweaving between thickly vegetated islands, and punctuated by numerous deep, shady pools. The river and adjacent bushland abounded with animal and bird life.

The river was a prime food and a profound spiritual resource to Aboriginal people (and it still forms part of a significant songline or dreaming trail to the present day Nyoongar people).

After the first settlement of York and districts in the early 1830s, the river was used for domestic purposes and stock watering, for fish and game and for recreation. Most of the deep shady pools were used as swimming holes on summer weekends. It was also a unique feature of the ecosystem, with characteristic riparian and aquatic vegetation and wildlife. The river was the central landscape feature of the Avon Valley and of the York townsite.

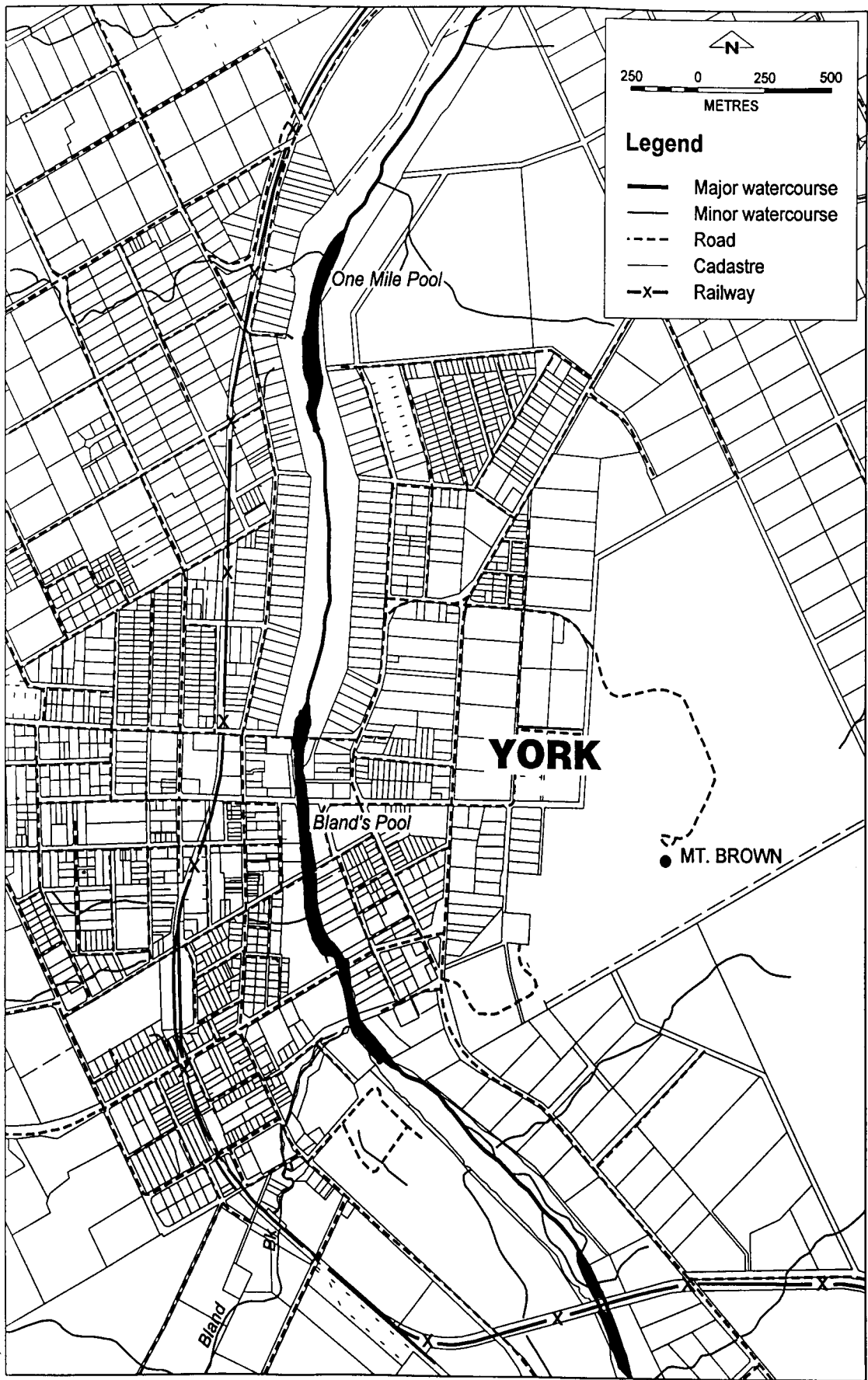
These values were largely intact until about the 1950s, but have since been seriously degraded. This was caused by the impacts of settlement, unsound engineering practices and misuse.





Map 1. Section 10 — York





Map 2. The York Townsite



York's Avon River has a number of serious problems. These include the range of problems which occur right along the central part of the river between Toodyay and Beverley, for example: salinisation, pollution with chemicals and organic matter, loss of riparian and aquatic ecosystems, infestations of weeds, rabbits, foxes and feral cats, sewage and urban drainage entering the river, and the movement of sediments into channels and pools.

The most serious problem in York's river section is the loss of the great river pools between Balladong and the mouth of the Mackie River. These once deep shaded pools are now filled with coarse sand which is steadily moving downstream towards the town pool. Mt Hardy and Cold Harbour Pools are completely gone, and Railway Pool is fast disappearing. Blands Pool (also known as Town Pool) was once a site for swimming carnivals; today it is so polluted that swimming is banned.

All of these problems are exacerbated by the unfortunate fact that a new generation has grown up, and are being followed by newer generations who did not know or appreciate the way the river once was, and who take the existing degraded condition as normal.

Excellent work has been done by the River Conservation Society and many river neighbours in recent years, and progress on urban wastewater disposal issues has started.

Despite this, the river will continue to degrade unless a new, shared vision is recaptured, and the York community feels that something positive about achieving this vision is possible. This Recovery Plan is needed to help to promote and sustain this message, as well as to set out a practical blueprint for local action.

1.3 The planning process

In preparing this River Recovery Plan, ARMA has adopted the following process:

- A public meeting was held in York to outline the objectives of the plan, and to welcome community input.

- The River Conservation Society and the York Shire were briefed and their input obtained.
- A consultant was appointed to facilitate the planning process.
- An advisory committee from York was set up. This committee comprised 19 people. The committee met seven times over a period of several months, including fieldwork along the river, and was responsible for preparing the first draft of the River Recovery Plan.
- After ARMA had considered the Draft River Recovery Plan, comments were sought from stakeholder groups and the York community.

This Final Plan was prepared in the light of input from stakeholder groups and the community, and adopted by ARMA.

1.4 Terminology and abbreviations

The "river management" terminology used in this plan is explained in Figure 1.

Abbreviations and acronyms used are as follows:

ARMA	Avon River Management Authority
APP	Agriculture Protection Program (former name of AGWEST)
DEP	Department of Environmental Protection
ICM	Integrated Catchment Management
LCDC	Land Conservation District Committee
RCS	River Conservation Society
RIWI (Act)	Rights in Water and Irrigation Act
SoY	Shire of York
SES	State Emergency Service
WRC	Water and Rivers Commission



2. Key issues

In preparing this River Recovery Plan, the following issues were identified as those which most impact on York's Avon River. They are not ranked, and are grouped under five broad headings: protection, conservation, tenure and urban issues, and community education.

2.1 River protection issues

- There is a need to identify all the agents which are degrading the river system (for example pest and feral animals, livestock, weeds, upstream sources of sediment and salt, inappropriate recreation) and build a strategy for eliminating the problem, or at least minimising it.
- Fencing of the river and its tributaries, so that stock can be excluded or carefully managed. The task is to identify riverside stretches not yet fenced and organise fencing, plus appropriate management arrangements for private land fenced into the river zone.
- Fire. There is a need to identify the values threatened by fire and problem sites or species, and to work with local fire control groups and river neighbours to minimise fire risks and damage. There is a range of related issues, for example: control of grassy weeds, firebreak management on blocks next to the river and access to and along the river for fire control work, post-fire rehabilitation and management.
- Sedimentation. Sources of sediment must be identified to reduce input from tributaries and movement of bedload sediments along the river, and to remove sediments from pools.
- Salinity. This issue affects nearly the whole catchment, but it is still necessary to develop a strategy which can be applied locally and which will contribute to the overall attack on the problem.
- Water quality and aquatic ecosystems are degraded by nutrient enrichment (especially phosphorous), pollution with organic matter and other chemicals (including biocides). Sources of pollution along the river must be identified, and a cooperative strategy developed to minimise the problem.

- Striking a balance between what is good for river conservation, and what can be achieved in the short-term. For example, grazing prevents regeneration of native plants, but controlled grazing may be needed in some places at some times to control invasive weeds and annual grassy fuel loads which constitute an unacceptable fire hazard.

2.2 Conservation issues

- There are several sections of the river which still have very high conservation value (eg. the relatively undisturbed section between Balladong and Railway Bridges known as Parkers Reach). A high priority is to ensure their protection and set them up as model, or demonstration river sections.
- There is considerable variation in the salinity of tributaries to the river. It is important to identify streams which are relatively fresh, and maximise their protection.
- The river pools are one of the river's greatest and most threatened assets. Pool protection and recovery is a high priority.
- Stabilisation of banks is needed in some areas, to control sedimentation, and allow regeneration of native species.
- Reducing river velocity is a key means of reducing other problems, for example movement of bedload sediments and scouring of the riverbed and banks. This aim can be assisted by installation of 'riffles' (engineered bars), by the protection/encouragement of vegetated islands, and by allowing the river to flow out onto the natural floodplain rather than be confined to a narrow channel.
- Revegetation of floodways is important to slow river flow and reduce soil erosion.
- The choice of species (flora and fauna) used in recovery work is critical. Some native species cannot cope with existing conditions; some exotic species have become weeds.



- Wherever possible, revegetation on land adjoining river bushland should enhance the formation of corridors to other patches of remnant bushland in the valley.
- It is necessary to consider the size and placement of dams on tributaries, and bores/mills on floodplain which will have the undesirable effect of reducing the inflow of relatively fresh water into the river.
- Pumping from or to the river and drainage into the river are issues where the net effect is an increase in salinity of the river, or otherwise a reduction in water quality.
- Some native species or ecotypes are more at risk than others; these need to be identified and the threat managed.
- Appropriate forms and timing of recreational use of the river and environs must be developed, and a system of careful recreation management applied.
- The river and its environs are littered with rubbish. It needs to be removed, and a system put in place to prevent new rubbish being discarded into the river.

2.3 Tenure issues

- Ownership of the river and its adjacent land is complex. It is important to understand ownership, and to review the need for changes.
- Which is the most appropriate form of management for particular sections of the river: Crown Reserves, private land governed by management agreements with ARMA? Alternative tenure arrangements need to be explored.
- Native title implications with respect to Crown land and the river need to be understood.

2.4 Urban issues

- Flooding threatens urban values, particularly in the York townsite, and along the floodplain. Flood mitigation needs to be considered as part of river management.

- There are several road and bridge crossings of the river. Do these need special management?
- Access to or over the river is very limited. This makes fire control difficult.
- The bulk of the street run-off, drainage, storm water, sewage and wastewater generated in York at present ultimately ends up in the river. Water Sensitive Urban Design and an integrated wastewater management program are needed for York and for development/settlements next to the river.
- Chemicals potentially injurious to the river are stored in the town. It is critical that storage is securely bundled and that there is a Spill Contingency Plan in place.
- Management of the town pool, an urban park setting within York, involves several key issues, including fertiliser use, structures in the river, the raising of the water level by a downstream weir, and safety.
- There are several historic or heritage features along the river, such as buildings and bridges and rocky crossings. There may also be anthropological sites or other sites important to Aboriginal people. These need to be identified and protected.
- There are some public health issues associated with the river, including disease risks to swimmers in Blands Pool, and mosquito plagues.

2.5 Community education

- It is critically important to continue to raise the interest in and knowledge of the river in the community (especially people living in York and along the river), and to encourage people to become involved in river conservation and recovery work and to take a pride in the outcome.
- There is a need to develop packaged information for delivery to target audiences, for example units on river science and conservation which can be taught in York schools, and a Handbook for River Neighbours, setting out the goals and techniques of sound land and environmental management along the river.



2.6 Principles for decision-making on priorities

The following principles are proposed as the basis for decisions on priorities for this River Recovery Plan:

Principles for determining priorities among many issues

- High priority should go to actions which have many positive outcomes for the river rather than few (example: fencing the river, slowing river flow, sediment management and urban wastewater management);
- High priority should be given to ensuring protection of the least disturbed features of the river system (examples: river sections which were not trained, tributaries which contribute much needed fresh water to the river, threatened ecosystems); and
- Projects which can involve and educate many members of the community should be given priority.



3. Proposed action

This section of the River Recovery Plan describes the issues of concern, the goal, the current status and the strategies to be adopted which will lead to the recovery of York's Avon River. Responsibilities and Timeframes for action are suggested. Priorities are dealt with in Section 4 of the plan.

3.1 Fencing

Livestock cause several problems when they graze in the bushland along the river, or move across the riverbanks and along the dry riverbed in summer. Problems include: defoliation or trampling of native vegetation, introduction of weeds, bank and river bed destabilisation and erosion, competition for habitat with native animals.

In some situations, controlled grazing of sections of the river may be necessary to reduce a serious fire hazard, and this may be approved by ARMA. However, this can only be managed if adequate fencing is in place to confine stock to the approved grazing area and to control the intensity of grazing.

The goal:

The first priority is to have stock-proof fencing in place on both sides of the river along the whole length of this recovery section, together with a positive management agreement with adjoining landowners to ensure fence maintenance. The second priority is to extend river fencing upstream along all major/important tributaries.

Current status:

There are 24 km of river boundary (outside of the townsite) in this river section. About 80% of this is already fenced on both sides of the river and about 20% is fenced only on one side of the river. Not all fencing is secure, or stock-proof. There are no formal management agreements in place with landowners adjoining the river.

A large-scale map showing the status of fencing as of March 1998 has been prepared.

ARMA has a river fencing policy and provides fencing materials to qualifying landowners, in return for which the landowner is required to enter into an agreement

about management of the fenced-off land which borders the river and maintenance of the fence.

Strategies:

- A list of priorities for new or replacement fencing will be drawn up.
- Landowners will be contacted and advised of the issue and the policy explained.
- On the basis of the map and priorities list, ARMA will implement its fencing grant/management agreement policy.
- Where landowners cannot carry out fencing themselves, assistance will be sought from service clubs, etc.
- Over time, fence condition and fencing needs will be monitored, and the map updated, and new or replacement fences organised.
- In general, ARMA will seek to have the river fenced only where the land is grazed, but because future land use cannot always be determined, the overall policy will be to have the entire river in the York section fenced.

Responsibility:

The River Conservation Society has prepared a map as part of the recovery planning process and can advise on priorities to ARMA, contact river neighbours and arrange help with fencing where needed. ARMA will continue to decide on whether landowners qualify for support, and where they do, will supply materials and ensure management agreements are entered into and signed up. Landowners will be responsible for fence repair and upkeep.

Timeframe:

The aim is to complete the initial fencing task within 18 months of finalisation of the Recovery Plan.

3.2 Livestock in the river

Uncontrolled grazing or overgrazing by sheep, or other hoofed herbivores such as goats, cattle, pigs and horses, will destroy native vegetation and lead to erosion of river banks and compaction of bushland soils.



The goal:

The goal is to have the whole bushland area adjoining the river free of uncontrolled grazing by domestic herbivores.

Current status:

Most of the bushland along York's Avon River is currently free of sheep, horses and goats. However, small flocks of "rogue" sheep are observed, and until the river is completely fenced, sheep will continue to accidentally enter the river bushland. The Avon River Channel Survey (1997) found stock on 24% of sites surveyed within Section 10.

Small flocks of domestic geese have also been seen along the river from time to time.

Strategies:

- The Fencing Strategy (above) will be implemented.
- A survey will be made to identify current location and type of stock in the river.
- River Conservation Society members and river neighbours will be asked to keep an eye out for roaming stock in the river, and where stock are observed, to advise ARMA.
- If livestock are located on crown land along the river, ARMA will contact SoY, who will be asked to use their powers to have the stock removed.
- Adjoining landowners will be advised that controlled grazing of stock, for example for weed or fire control purposes, may be approved by ARMA on a case by case basis. ARMA will indicate when and where grazing can occur, including the need for fencing.

Responsibility:

The RCS will carry out the survey and report to ARMA. River neighbours will also be asked to act as ARMA's eyes and ears with respect to livestock in crown land along the river. The SoY will be responsible for control or disposal of stray stock.

Timeframe: On-going

3.3 Fire

Fire is a threat both to the river environment and to river neighbours. Fire in the bushland along the river results in loss of habitat (especially old trees), loss of

rehabilitation plantings, soil erosion and increased weed growth.

Skilled use of fire can also be an effective agent for regeneration.

Bush fire brigade personnel see the river as a place where fires are hard to tackle and to prevent, because of poor access and heavy, grassy fuels. Many people living near the river are not trained fire managers and most do not understand the causes of fire, the effects on the bushland, the basics of fire prevention and safety, or what to do in the event of a fire.

The river is a special problem because (i) it is a long linear line of bushland running through the town and rural areas; (ii) lengthy sections are fenced off, or are inaccessible to fire fighting vehicles and (iii) the bushland has been disturbed and carries exotic grass fuels.

Neighbouring areas are also a fire management problem because they are rural residential settlements, often with non-resident owners, or they are high-value cropland.

The goal:

The aim is to manage the fire problem along the river so as to minimise the threat to the river environment and to neighbours. Parallel aims are to educate river neighbours and encourage them to take responsibility for protecting their own assets, and to educate fire managers about the value of the river.

Current status:

The river is largely unmanaged in terms of fire. There have been many fires in and adjacent to the river over the years. Fires are started by lightning, stubble burning, carelessness and arson. Access for firefighters to the river, along the river and across the river is poor. There are heavy stands of wild oats. There are many properties adjoining the river where fire prevention is not responsibly practised. The Shire of York is promoting a cooperative-ordinated approach, involving ARMA and the local firefighters.

Strategies:

- A York's Avon River Fire Management committee will be formed, under the leadership of ARMA and the SoY. This committee will have representatives of the Shire, the Fire Brigade, the Chief Fire Control Officer, the Bush Fires Service, ARMA and the River Conservation Society.



- The purpose of this committee will be to (i) develop and implement a Fire Strategy for the river which identifies and minimises the threat of fires entering and leaving the river; (ii) ensuring fire prevention work is properly carried out on properties neighbouring the river and (iii) ensuring that all concerned are trained in the need to protect river values. The Strategy adopted must comply with ARMA's Fire Management Policy and be approved by ARMA.
 - The Shire will be asked to enforce the Bush Fires Act on properties adjoining the river, especially small holdings with heavy fuel loads, and absentee owners.
 - The Shire will be asked to ensure a Fire Management Plan is prepared for all new subdivisions adjoining the river and for this Plan to be endorsed by ARMA.
 - The Shire will be asked to implement the fire management provisions and the Bushfire Response Plan for Gwambygine Park (1995).
 - A pamphlet or Handbook for River Neighbours will be prepared by ARMA (in consultation with appropriate groups including the Shire) and issued to all river neighbours. In the section on fire, this will stress the responsibilities of landowners to take responsibility for protecting their own assets, and will explain the basis of fire management along the river.
 - Landowners along the river will be asked to install gates on fences along and at right angles to the river, to assist access for firefighters. Where this is done a sign displaying "Fire Access Point" will be placed on the front gate of the property.
 - The Shire will be asked to review its Fire Break Order for properties adjoining the river, to require firebreaks to be trafficable to fire trucks, rather than cultivated strips which bog vehicles in winter and erode in the summer.
 - Landowners will need to keep firebreaks out of the floodway of the river.
 - Western Power will be requested to review fire protection measures along power lines running through or along the edge of river bushland. Problems noted include trees overhanging wires, and grass at the foot of poles.
 - In the wake of a fire, prompt action will be taken to rehabilitate any new dozed firebreaks and to ensure the burnt bushland is securely fenced to prevent stock grazing off natural post-fire regeneration.
 - The possibility of upgrading the old Gwambygine and Hoops Road Crossings for cross-river fire vehicle access will be examined, in conjunction with other planned measures for slowing river velocity and trapping sediments.
 - ARMA will develop and maintain a data base of fires, so that an accurate fire history for the river bushland can be built up over time.
- Responsibility:**
ARMA and the Shire of York will be responsible each year for convening the Committee, organising a field day and a report on action to be taken, and following up to see that action occurs. The Shire will be responsible for enforcement and fire management on its land. River neighbours will be responsible for protecting their own assets.
- Timeframe:**
These initiatives should be developed during winter/spring 1999 and then be put in place before summer 1999/00. Henceforth, the action will be ongoing annually.

3.4 Salinity

In previous years the Avon River was brackish but in more recent decades has become highly saline. This is partly a result of land clearing and farming practices on the catchment and partly due to natural processes. High salinity threatens river and riparian flora and fauna and landscape and recreational values.

A specific threat in the York area is to flooded gum (*Eucalyptus rudis*), the principal large tree growing along the river. Flooded gums are susceptible to high salinity, and will over time be replaced by swamp sheoak (*Casuarina obesa*) unless action is taken.

Salt water is entering York's Avon River section from upstream, from the Mackie River and lesser tributaries and from movement downslope of saline groundwater. It is recognised that the overall problem cannot be solved within the York river section.



The goal:

To minimise salt movement into the Avon River.

Current status:

Preliminary information has been collected on the relative salinity of the main tributaries to York's Avon River.

The WRC is organising a major aerial geophysical survey of the river so that high salinity risk and impact areas can be mapped. This information will be available in 1999.

A map has been prepared by York resident Shane Moad which shows the current salinities of the main tributaries to the river measured in 1997/98 and this information has been made available to ARMA.

Strategies:

- The sources of salt and salinities of tributaries to the river will continue to be studied and a data base developed and maintained.
- Other sources of fresh water (eg. springs in or next to the river) will be identified, and measures taken to protect them.
- Sources of fresh water, or marginally fresh water will be identified and protective measures for these will be given very high priority. This will involve ARMA negotiating with the relevant land owners, and arranging measures such as fencing, revegetation, and recharge management.
- ARMA will support the development of a York's Avon River Strategic Revegetation Plan. This will need to involve consultation between the LCDC, landowners and others involved in landcare and revegetation. The plan should emphasise replanting of bare hills (recharge areas) and of floodplains (discharge areas) along the main river valley.
- Salinity management by agencies and Catchment Groups will be supported.
- Research into salinity management will be encouraged. Specifically, Murdoch University will be asked to conduct research into developing salt-tolerant stock of flooded gum and York gum for replanting along York's Avon River.

Responsibility:

The RCS will conduct surveys and monitor salinity of tributaries and report to ARMA. ARMA will be responsible for instituting protective management of fresh water sources and for working with the LCDC and landowners to develop and implement a strategic revegetation program for recharge and discharge areas.

Timeframe:

Fresh water resources will be identified and action commenced to protect them within one year.

3.5 Sedimentation of the river

Sections of the river have become, or are becoming clogged or buried with sand and silt sediments. Two major pools have completely disappeared, and a mass of sand is moving downstream towards Parkers Reach (the river section adjoining Balladong Farm) and Town Pool. The source of these sediments are (i) movement of river bedload; (ii) soil erosion on the catchment; and (iii) movement of sediments from roads and tributaries.

A major cause of sediment movement is the higher velocity of the river in the wake of the Training Scheme. This problem is being tackled elsewhere in part by the installation of "riffles". In the context of this plan a "riffle" is taken to be an engineer-designed low rock bar, or some other form of engineered structure, placed across the river at a strategic point with the aim of slowing river velocity. These structures can also be used to create places where sediments will be deposited and can be later removed.

Under both the Environmental Protection Act and the Waterways Conservation Act, excess sediments deposited in the river can be classified as pollution.

The goal:

To minimise sediments entering the Avon River and its tributaries, to reduce the movement of sediments along the river, to stabilise the river banks, and to remove sediments from the river at selected points.

Current status:

The presence of sediment slugs and sections where banks are scouring were identified as part of the 1996/97 river survey and this information is being updated using aerial survey by Curtin University. The major slugs identified are those moving out of the Mackie River and the former Mt Hardy and Cold Harbour Pools.



Strategies:

- River sediment deposits and movements along the section will continue to be identified and mapped, when the information from the Curtin University study is available.
- Priority must be given to stopping the downstream movement of sediment from Cold Harbour and Railway Pools into Parkers Reach, while at the same time preventing the further movement of sediments into the Mt Hardy/Cold Harbour/Railway Pool complex.
- Three places are nominated along the river where the initial series of properly engineered ‘riffles’ must be installed. Sediments accumulating behind the riffles will be regularly removed. The three places are Gwambygine Crossing, the mouth of the Mackie River and the foot of Cold Harbour/Railway Pool complex. ARMA will carry out the installation of the riffles and the trapping and subsequent removal of sediments.
- The need for further riffle points and sediment traps will be reviewed in the years ahead, in the light of the success of installing and managing these structures.
- Sediment removal, starting from the Mackie River mouth and moving progressively downstream, will be organised with the aim of restoring the great pools and preventing their refilling.
- Islands which can potentially act as sediment traps, or which slow the river velocity, will be identified and steps taken to consolidate and revegetate them.
- River banks subject to scouring will be identified, and revegetated /stabilised.
- Floodplain areas which are a potential source of sediment during floods will be identified and land owners encouraged to institute farming and land management practices which stabilise and conserve soil on site.
- Roads and firebreaks which contribute to sedimentation will be identified and the Shire or landowners asked to re-engineer the drainage from them, to prevent sediments entering the river or major tributaries.

- Where sediments removed from the river have commercial value, ARMA will seek to return any income to the river for conservation and management works. Wherever practical and cost-effective, and with river neighbour agreement, sediment stockpiles will be developed on private land, rather than within the bushland along the river.

Responsibility:

Mapping and survey work will be undertaken by ARMA. Engineering works will be designed by the WRC.

Timeframe:

Riffles will be installed and sediment traps and sediment removal organised as soon as funds are available. Excavation and rehabilitation of Railway Pool is vital to protect the pristine area immediately downstream, and the sediment trap at the foot of Cold Harbour Pool is essential to stop sediment movement into York townsite. Planning for these works should begin immediately.

3.6 River pools

The pools of York’s Avon River are silting up, and their ecological value, water quality and aesthetics have declined. A specific ecological value is the provision of summer refuge for aquatic flora and fauna.

The goal:

To protect existing pools, and to recover degraded pools, so that they contribute positively to the river environment, and are places which can be enjoyed by the community.

Current status:

There are five river pools in York’s Avon River. Their names and status are shown in the following table:

Pool name	Current status
Mt Hardy	Completely filled with sediment, but banks stable.
Cold Harbour	Completely filled with sediment, but banks stable.
Railway	Rapidly filling and banks eroding.
Blands (Town)	Contains a sand slug in the centre of the pool. High nutrient content, water is eutrophic. Banks stable.
One Mile	Partially filled and filling. Highly polluted.



Curtin University is mapping sediments upstream of pools.

Strategies:

Strategies to protect and restore pools are discussed above under sedimentation. In addition the following strategies are recommended:

- A specific management plan will be prepared for One Mile pool and for the linked pool complex of Mt Hardy/Cold Harbour/Railway Pools. The idea is to increase summer water depth, improve water quality, improve and stabilise riparian vegetation and habitat, improve the aesthetics of the pools and their environs, and prevent the pools refilling.
- Blands Pool will also be the subject of an individual management plan - this is dealt with in detail in section 3.16 of this plan.

Responsibility:

ARMA will plan and oversee pool restoration and management in consultation with the Water and Rivers Commission, the Shire and all interested groups. ARMA will be responsible for final works approvals and the WRC for all engineering design work.

Timeframe:

This work will begin as soon as possible and will then be on-going until all the pools are restored and management procedures are in place to handle resiltng.

3.7 Weeds

Weeds degrade the bushland along York's Avon River. They are a fire hazard, replace native vegetation, prevent the regeneration of native vegetation, and are often visually unattractive. The worst weeds are those which are invasive, ie. they tend to completely take over a site once they become established.

Some introduced species perform a useful role in rehabilitation and river bank stabilisation, for example saltwater couch grass (*Paspalum vaginatum*). These species should be tolerated in the short term.

Weed control programs offer a good way for the local community to participate in positive recovery work along the river.

The goal:

To control weeds in bushland along the river, and replace them with native species.

Current status:

Weeds abound in bushland along the river. These include wild oats, doublegees, dock, Cape tulip, watsonia, calthrop, bridal creeper, Patterson's curse, African box thorn, kikuyu grass and capeweed. The River Channel Survey (1997) reported olive trees growing upon the bank of 10% of sites surveyed, and tamarisk trees on 5% of sites. Non-indigenous trees have been recently planted along the river in some places for revegetation purposes.

At this time, no aquatic weeds have been observed.

Strategies:

- Weed control will be a high priority for ARMA, assisted by community groups, river neighbours and the SoY (Gwambygine Park and within the townsite). All involved in the river will be encouraged to maintain constant vigilance for new weeds or new weed outbreaks.
- ARMA will support existing volunteer weed control groups, such as York's Cape Tulip Control Group.
- A weed survey will be undertaken on foot along the river, and a map of weed infestations prepared. This will be used as a basis for control programs. First priorities will be given to control of declared noxious weeds, and invasive environmental weeds such as bridal creeper, Patterson's curse, boxthorn and tamarisks.
- High priority will also be given to controlling small new infestations of weeds which are relatively easy to control, for example watsonia.
- Second priority will be given to species which are a fire hazard, such as wild oats. Third priority will be the elimination outside the townsite of colonising exotic trees such as olives and tamarisks.
- Wherever possible, control of weeds will start at the upstream end of the section or a break in the river corridor eg bridge crossings and proceed downstream.



- The advice of the APP will be sought on methods of weed control, including safe and environmentally responsible use of herbicides.
- The cooperation of river neighbours will be sought in controlling movement of weeds, reporting weeds to ARMA, assisting with control and keeping a lookout for new weed infestations, including aquatic weeds.

Responsibilities:

Weed control will be the responsibility of ARMA, assisted by community groups and neighbours. The cooperation of the APP will be sought.

Timeframe:

Weed management is urgent, especially with the mounting problem of some invasive species such as Bridal Creeper. Action on mapping and controlling weeds should begin immediately.

3.8 Feral and pest animals

Feral and pest animals are present in the bushland along the river. The main ones are foxes, feral cats and rabbits. These animals prey upon native fauna, or destroy native vegetation, or move out onto neighbouring properties as vermin. Other potential pests include the Little Corella, which forms large flocks that can damage revegetation works and defoliate trees, the 28 Parrot, which destroys grass trees and attacks young native trees of a range of species, domestic geese which foul small pools in summer and chase away native birds, and introduced fish such as carp and gambusia.

Mosquitoes are a problem pest in some seasons along the river, but their numbers can usually be controlled by good domestic practices.

There was a locust plague which affected river bushland in the early 1990s.

The goal:

To eliminate feral and pest animals from bushland along the river, and to control re-invasion with ongoing control programs.

Current status:

Rabbits and foxes have been controlled on previous occasions, but have re-invaded and current populations are high. No control of feral cats has ever occurred.

There is one flock of Little Corellas, which is increasing. Occasional “wild dogs” have been reported; these are assumed to be domestic dogs, not dingos. Pigs (probably domestic) have been seen along the river in the past, but are not now present.

Strategies:

- ARMA will work with the Shire, APP and landowners to develop cooperative-operative control programs for feral and pest animals (including locusts if another plague occurs).
- Community groups and neighbours will be asked to note and report problems, such as rabbit burrows, high fox numbers.
- The Shire Health Officer will be requested to maintain education programs on mosquito prevention strategies by home-owners.

Responsibility:

ARMA will seek to develop cooperative control programs.

Timeframe: On-going.

3.9 Rubbish

Over many years, people have been dumping rubbish along the river, or rubbish has been washed in to York’s river from upstream. “Rubbish” includes discarded household or farm items, plus bulbs, seeds and cuttings from gardens which may become weeds.

Current status:

Rubbish in the form of plastic, cans, car tyres, bottles and other debris occurs all along York’s Avon River. Some sections have been tidied up by adjoining landowners or volunteers from time to time, and the current situation is reasonable, but no on-going cooperative approach exists.

The goal:

To remove existing rubbish and to minimise future rubbish deposition.

Strategies:

- An initial focus event will be organised, known as “Cleaning up York’s River”. This will be followed later by a series of “River Clean-up Days”; we will seek to involve volunteers, service groups, schoolchildren, river neighbours.



- An education campaign will be conducted to promote a sense of pride in the river, and to change people's attitudes so that they do not put rubbish in the river.

Responsibility:

The Shire and community groups will jointly organise the clean-up campaign, and local schoolteachers will be asked to conduct the educational program.

Timeframe:

The main drive on cleaning up the river is to be completed within two years.

3.10 Chemical pollution

York's Avon River contains a range of chemicals which degrade water quality and lead to eutrophication. The most serious pollutants are phosphorous, nitrogen and organic matter. The sources are urban wastewater, sewage, stormwater, industrial discharge, and fertilisers in farm drainage and groundwater. The effects of chemical pollution can be catastrophic (eg. a spillage of herbicide or oil tanker accident) or insidious and cumulative (eg. slow leakage from a storage area, or drainage from lawns or cropland). The latter causes a buildup over years, and becomes evident when plants and animals along the river begin to die, or there is an algal bloom in the pools.

Some pollutants are deposited in river sediments. The removal of sediments from pools or slugs will also help to remove some pollutants, eg. phosphorus.

Monitoring, analysis and control of chemical pollution is expensive and requires high technical skills. In general this will be a job for the WRC and the DEP, with the role of ARMA and local people to provide information and feedback.

The goal:

To assist the WRC and DEP to identify all sources of pollution and put into place strategies which will eliminate or control or minimise them.

Current status:

There are high levels of phosphorous and nitrogen in the river water, and in some sediment deposits. Pollution with organic matter (sheep faeces) is high after summer rain. Levels of herbicide are not known. There are several sites in the York townsite and on farms next to the river where hazardous chemicals are stored.

Strategies:

- Sources of key pollutants will be identified. In particular, ARMA will conduct a survey of industries within the York townsite and along the river, to identify chemicals stored and used, disposal methods and to provide an opportunity to educate chemical users.
- ARMA will continue to cooperate with the Shire and the Fire and Rescue Service to implement the contingency plan to handle a major chemical spill in or near the river, and to be part of the WAHEMS planning and operational network.
- ARMA will establish an ongoing meeting forum with the Shire of York to discuss stormwater discharge from the town into the river, and to progress a better system of wastewater disposal.
- The Shire will be asked by ARMA to increase the application of "Water Sensitive Urban Design", in particular the development of detention basins to strip sediment and other undesirable components from stormwater.
- ARMA will seek to ensure that any new subdivisions, urban or industrial developments or intensive agriculture adjoining the river must incorporate the principles of water sensitive urban design.
- Landowners adjoining the river or along the main tributaries who are a source of chemical pollutants will be contacted and the problem explained. They will be encouraged to eliminate or reduce polluting activities. In the case of serious point-source pollution, if encouragement does not work, ARMA will contact the DEP and request its assistance.
- ARMA will review with farmer-neighbours along the river, the overflight of the river by crop spraying aircraft. The aim will be to minimise overflight of the river, or impacts of spray drift on river bushland or newly planted seedlings or regeneration to ensure Spraying Code of Conduct is maintained.
- ARMA will ensure weed and pest control programs in the river bushland are done responsibly, to avoid waterway contamination with pesticides.



Responsibility:

The WRC and ARMA will be responsible for oversight of this work, the Shire will be responsible for urban issues.

Timeframe: Ongoing.

3.11 Recreation

The river is a source of pleasure to many people in the community, and can be used for many forms of recreation. Some forms of recreation have little or no impact on the river; others are environmentally unsuitable. ARMA has a detailed Recreation Policy for the Avon River. Strategies applied in this Recovery Plan conform with that policy.

The goal:

To ensure that appropriate recreational activities along York's Avon River can be enjoyed by the public without deleterious impact on the river environment or its recovery.

Current status:

This section of the river is part of the Avon Ascent project. Very little of York's Avon River is used for recreation, outside of Avon Park and Gwambygine Park. Current activities include some bushwalking and nature enjoyment, and some canoeing, horse-riding and trail biking. Occasionally motor boats are launched from Gwambygine and motor down to York. This is not part of an organised event. It is expected that recreational pressure will grow, including commercial activities. However, because the bulk of the riverside land is privately owned, recreational development is inherently constrained.

An application for funding for upgrading the Avon Walk Trail has been prepared by the Shire.

Strategies:

- The river will be classified into two activity zones. The two categories are:
 - (i) The Developed Recreation Areas, of which three are proposed: Gwambygine Park, Avon Park and a new bush picnic area to be developed at One Mile Pool downstream of York. Developed Recreation Areas will have facilities, such as BBQs, toilets, tables, playgrounds.

- (ii) The Undeveloped Recreation Areas, which comprises the section upstream from Avon Park to Gwambygine Park, and where no recreational facilities will be established.

- In the Developed Recreation Areas, recreational activities will be controlled by the Shire of York. These are already spelt out in a detailed management plan for Gwambygine Park which was adopted by the Shire in 1995. Further site development at Avon Park and One Mile Pool will be the subject of site plans to be prepared by the Shire, in consultation with community groups, for endorsement by ARMA.
- At all of these sites, ARMA will encourage the integration of education with recreation. Sites should have interpretative material (signs, pamphlets, self-guiding walks or drives) which inform site users about the river, its ecology, history, use, current management and recovery.
- In the Undeveloped Recreation section of the river, only those activities consistent with river conservation and recovery will be allowed. These are: walking, picnicking (without campfires), canoeing and kayaking, swimming, bird-watching, fishing, nature study, contemplation, art, photography, and dog exercising.
- In these areas the following activities will not be allowed: overnight camping, power boating, horse, camel or donkey exercising or riding, off-road motor cycling or 4-wheel driving, shooting (except for exotic pest or feral animal shooting undertaken as part of a managed pest-control program), jet ski riding, or the release of exotic fish or birds.
- There is already a demand for some of these activities along the river. ARMA will cooperate with the Shire to find alternative, suitable sites and to publicise these to the community.
- Formal walking trails will not be built along the river south of the townsite to Gwambygine.
- The present Avon Walk Trail will be upgraded and developed into a loop walk taking in both sides of the river, with interpretative material (signs, pamphlet) to inform walkers about the river and the bushland along the river. The trail on the western side of the river will be built so that it is at least a metre wide, and surfaced with gravel, so as to be accessible to people in wheelchairs.



The first stage of a loop trail would only be usable at low water, with a marked crossing below One Mile Pool, but a later stage could take the trail as far as the all-weather crossing at Mackie Siding (beyond the scope of this Recovery Plan).

Where commercial recreational activities are based on the river experience, ARMA will seek to recover costs.

An education campaign will be held, to inform the community of these strategies.

The impact of recreational use of the river will be observed, and the above approach may need to be modified over time.

Responsibility:

The Shire of York will be responsible for managing recreational activities in the Town and at Gwambygine Park. ARMA will inform the public about its policy for the remainder of the river. Community group members and neighbours will be asked to report non-permitted uses to the Shire or to ARMA.

Timeframe:

High priority will be given to design and construction of the new Avon Walk Trail. Other work will follow as funds permit.

3.12 Community education

The speed of recovery of York’s Avon River to its natural functions and former beauty, will depend on how well the local community understands rivercare

issues, shares a positive vision, and is prepared to contribute time, energy and funds to the needs of the river. This highlights the need for good communication between river managers, and the wider community.

Also, there is a need for two-way communication. The community needs a forum in which it can pass on its concerns and achievements to ARMA, and ARMA needs to be able to draw upon the expertise and local knowledge of the York community.

The goal:

To ensure effective two-way communication between ARMA and key audiences in the York community about the Avon River and its recovery, care and protection.

Current status:

Apart from some government officers, members of ARMA, the LCDC and the RCS, there is a poor level of understanding of Avon River issues in the York community. Many young people or newcomers to York accept the current degraded state as the normal state. Other people have deep concerns, but feel powerless to change things. ARMA has recently adopted a communications strategy, but this is focused on the whole river, not the local scene.

Strategies:

- An appropriate message will be developed for key audiences in the York area, to be followed by a program of communicating these messages over time. Key audiences and messages are:

Key York Audience	Key messages for these audiences
• Schoolchildren and young people	• The natural history of the river, and the history of river use; the vision for the future; what is expected of them; what the rewards will be for them in the future; what they can do.
• The Shire of York	• The expectation that they will incorporate this Recovery Plan into their overall planning schemes for the Shire; the need for water sensitive urban design; their responsibilities for high quality recreation and road management.
• The LCDC, catchment groups, farmers and small landholders group	• The benefits to the river of revegetation, soil conservation practices on farms.
• The River Conservation Society	• Its role in implementing this recovery plan, and in providing feedback to ARMA on all aspects of river management in the York area.
• Riverside neighbours	• Their responsibilities in the areas of fire, stock control, fencing, soil conservation, waste disposal and chemical use, and acting as “eyes and ears” of ARMA.
• Fire Authorities	• The contents of this Recovery plan with respect to fire.
• Tourist bureau and operators	• This Recovery plan and section on recreation.
• Relevant Aboriginal people	• This Recovery plan



- ARMA will continue to implement its Communication Strategy, in particular to keep its slogan “Cherish our Avon River” in the public eye. ARMA will seek feedback from the York community on its concerns, views, priorities and needs with respect to York’s Avon River. Packages of educational material need to be developed for insertion in curricula at York’s schools, to enable teachers to deliver programs on river science, conservation and recovery. The LCDC and the RCS will be asked to help prepare these.
- The Community Landcare Coordinator will be asked to incorporate information from this Recovery Plan in his course for schoolchildren on the Fundamentals of Landcare.
- ARMA will continue to support the Avon Ascent Program. This program is aimed at education of city people about landcare in the Avon River catchment, but also helps to educate local people through the information pillars at Town Pool and Gwambygine Park.
- ARMA will continue to support the Ribbons of Blue/ Waterwatch program, as a means of involving the community and York schoolchildren in river management.
- A Handbook for River Neighbours will be developed, covering issues in this recovery plan which are relevant to people living next to or near the river. This will be distributed by ARMA, and updated and redistributed from time to time. Cooperation will be sought from the Shire and real estate agents to help with distribution to new residents along the river.
- ARMA will continue to publish its Newsletter, for dissemination to The Shire of York, river neighbours and other stakeholders, in which reports of progress with river recovery at York will be included.
- ARMA will conduct seminars, workshops, field days and guided walks in York from time to time, to provide information about the river to the community, provide a progress report on the recovery program, and to seek feedback from York people. River Education Displays will be set up at annual York festivals.
- The Cooperation of the York media will be sought to contribute to dissemination of positive messages about the river.

- In the longer term, the section of York’s Avon River between Gwambygine Bridge and Balladong Bridge will be developed as a model area for demonstration of quality river conservation to the community.
- A collection of old photographs of the river will be put together to show what has been lost and will be retrieved. The collection will be published and used as an education tool.

Responsibility:

ARMA will be responsible for overall communication with key audiences, but will seek assistance from community groups and local people, including schoolteachers.

Timeframe: High priority, on-going.

3.13 Revegetation

The bushland areas adjoining York’s Avon River have become degraded in the past 40 years. This is due to weed invasion, and loss of species due to salinity, fire and grazing. Most of the floodplain, the midslopes and the high hills overlooking the river valley have been cleared. These areas are used for cropping, grazing, hobby farming or rural residential lifestyles.

The goal:

To re-establish natural, stable vegetation in bushland along the river, using indigenous species adapted to the sites; and to rehabilitate the floodplain and hills with local woodland and shrub species and non-invasive introduced species well adapted to the York climate and soils where appropriate or necessary.

Current status:

Most of the river banks and the floodway are currently vegetated, but in some places this is exotic vegetation, such as wild oats. Some revegetation has taken place over the years for river bank stabilisation, and replanting has occurred on several locations along the floodway. Sometimes inappropriate species have been used, and in some cases revegetation has been hampered by grazing, or weeds. The LCDC has produced a guide to revegetation in the York area and the RCS has native vegetation lists for the riparian areas, the mid-slopes and the hill tops.

There is no cooperative revegetation plan which takes in the river bushland and adjacent private land up to the top of the hills, or back up the river tributaries.



Flooded gum is considered to be an endangered species in this habitat, because of its vulnerability to salt.

Strategies:

In addition to the work proposed under the headings of salinity and sedimentation, in which it was proposed that ARMA support the development of a Strategic Revegetation Plan for areas along the river, it is recommended:

- Only local indigenous species tailored to their natural soil types should be used in revegetation along the river.
- Detailed recommendations on species to be used in revegetation along the river will be spelt out in the River Neighbours Handbook which is to be prepared by ARMA.

Responsibility:

ARMA will produce detailed guidelines for incorporation in its River Neighbours Handbook, based on local knowledge and experience.

Timeframe: Ongoing.

3.14 Flood mitigation

Almost every winter, the Avon briefly overflows its immediate channel, and in about one year in three it floods across the floodway and beyond. Flooding was part of the natural functioning of the river before 1955. Flooding usually occurs when the inland lakes are filled by summer thunderstorms or cyclonic events, followed by above-average winter rainfall.

The town of York, and many houses and other items of property or infrastructure are built on the river floodplain and are potentially threatened by flood damage.

Flood damage has been minimal in recent years due to (i) the river training scheme which increased the depth of the river channel (thus increasing flood storage capacity) and opened up the bushland adjoining the river, thus minimising the frequency and duration of over-bank flood events and (ii) below average rainfall since the 1950s and especially since the 1970s. Higher water levels and flooding of urban land is considered to be more likely in the future if average rainfall patterns recover, and the clearing and channel deepening caused by the river training scheme are repaired or if sand slugs

move into the braided channels south of the townsite. It will be essential that these changes are preceded by improved flooding preparedness and flood management along the river and in the town.

Flooding has environmental benefits. Annual inundations of the floodplain revitalise the native understorey species, and help to control grassy weeds such as wild oats, which in turn will help to reduce summer fire hazards along the river and the regeneration of native vegetation. Prolific regeneration of swamp sheoak usually follows a flood. This is also ordinarily true for flooded gum and swamp paperbark on floodplains.

The goal:

To minimise the impact of damaging floods on the town of York and infrastructure and houses on the floodplain, while maximising the environmental benefits of flooding in the bushland.

Current status:

There is a poor understanding of river flooding in York and along the river, and many people are complacent about flood risk and damage. New buildings are regularly being built on the floodplain. No Flood Contingency Plan exists to minimise damage if a flood occurs, and there is no Flood Damage Prevention Program for the townsite. However, ARMA, the Meteorological Bureau and the State Emergency Service are developing a flood contingency plan for the whole of the Avon valley, including York.

Maps showing the 1:100-year flood level for the town are available, but not for rural areas along the river. Despite a number of serious floods before the 1960s no 1:100 year flood event has occurred on the Avon River in the 20th century.

Strategies:

- ARMA will ask the WRC to prepare maps which demonstrate the likely heights of 1:100 year and 1:50 year floods along York's Avon River.
- This map will be used to publicise potential risks to the Shire and to river neighbours;
- ARMA will put up signs and 100-year flood markers in town (in hotels, petrol stations and supermarkets) to demonstrate the levels of past floods;
- ARMA will seek to highlight to the Shire and to developers the risks of developments which lead to



flood flows down small creeks in town or along the river. Remedial measures such as compensation basins will be recommended.

- ARMA will continue to liaise with other organisations to prepare a Flood Contingency Plan for York. This will encompass prevention requirements and action in the event of a flood.
- ARMA will help to develop and to see adopted an Avon River Flood Hazard Management Plan
- All river recovery work, such as installation of riffles and revegetation, will be reviewed in the light of their potential effect on flooding of private and public assets.
- Natural flooding frequency and duration will be encouraged on floodplains where no assets are threatened, so as to encourage natural regeneration and discourage weeds.

Responsibility:

Flood mitigation planning will be the responsibility of ARMA and the Shire of York. River neighbours will need to keep valuable assets out of the floodplain, and expect to be subject to occasional flood events.

Timeframe:

Work on flood risk identification and community education about flooding to start before winter 2000.

3.15 Historic and heritage sites

There are several historic buildings and structures along and adjoining the river. These include old homesteads, bridges, and river crossings. These are part of the history of the York district.

Aboriginal people have strong associations with parts of the river comprising songlines or dreaming trails, and have other significant sites along the river.

The goal:

To identify and preserve important historical and heritage sites or features.

Current status:

The SoY has undertaken a Municipal Inventory of historic or heritage sites, but this has not been extended to areas outside the townsite. The existing inventory needs to be extended to rural areas along the river. Most historic sites along the river are degrading.

Strategies:

- The York Society will be asked to survey the river and environs to identify all historic sites.
- Landowners responsible for historic sites will be asked to ensure at least their minimum protection from fire or vandalism. ARMA will seek ways of supporting landowners who wish to protect such sites along the river.
- ARMA will take all care to avoid damaging historic sites during river management work.
- ARMA will advise Aboriginal people of the area that they wish to cooperate in protection of any sites or features of value to the Aboriginal people along the river.
- Aboriginal people will be asked to review all proposed works, such as construction of engineered “riffles”, before commencement, to ensure sites of significance are not disturbed.
- ARMA will liaise with the WA Museum and the Aboriginal Affairs Department to ensure any archaeological sites along the river are protected.

Responsibility:

ARMA will make the necessary liaisons with bodies mentioned above and will encourage them to undertake the surveys and report back.

3.16 Avon Park

Avon Park is the day-use area adjoining the river within town. It is managed by the Shire of York.

The goal:

To maintain Avon Park, including the river, as a place of beauty and enjoyment for local people and tourists to York, and a place where visitors can learn about river conservation.

Current status:

Development to date has concentrated on the parkland and visitor facilities on the western side of the river only. There are reticulated lawns, a rotunda, toilets, playgrounds and picnic areas. An information pillar has been erected by the Avon Ascent committee. A swing bridge crosses the pool and there are the rotting remnants of the old swimming cradle. The river is highly degraded and there are signs warning swimmers of serious health risks.



An engineering survey of the pool has been completed, and ARMA has provided funds to the Shire to prepare a management plan.

Some road drainage, especially from the east side of town, tends to end up in the Town Pool.

Strategies:

The Shire will be requested to prepare and submit to ARMA for approval, a development plan for the park, including Blands Pool, incorporating both sides of the river, and a new viewing platform.

- The Shire will be requested to control drainage of waste water, fertiliser and sewage into the river from the park, and also from nearby public facilities according to the principles of Water Sensitive Urban Design.
- The Shire will be requested to review disposal of road drainage water from both sides of town into the pool.
- Community education about the pool should include information on the ecology of the area, as well as its history and management.

Responsibility:

Shire of York, in association with ARMA.

Timeframe:

High priority to upgrading drainage, and other work if possible to be completed within two years.

3.17 Pumping and drainage from farmland into the river

Disposal of agricultural wastewater into waterways by pumping or in deep drains is one of the most contentious issues in land management in rural WA. There is a Government-sponsored task force looking at all aspects of the issue, and ARMA is formally involved.

It is not appropriate to deal with this issue in this Recovery Plan. The plan will be updated and approved strategies included when the overall policy on pumping and drainage is clear.

3.18 Land tenure along the river

There is a mosaic of land ownership along and including York's Avon River. The river itself (the water) is proclaimed under the RIWI Act, so that the Crown has control of the waterway to highwater mark, regardless of land tenure for the purposes of the Act. Land tenure beyond the river includes: private ownership which in some cases extends to the river bed beneath the river; Vacant Crown Land between the river and private land; unvested crown reserves or reserves vested in the Shire of York; and private land which is the subject of a management agreement with ARMA.

The goal:

To minimise the tenure of all land within and adjacent to the floodway of the river to two categories:

- (i) Crown land which is managed according to ARMA's policies; and**
- (ii) private land which is the subject of a management agreement between the landowner and ARMA.**

Current status:

Land ownership is not clearly identified. ARMA has a firm policy, but this can only be applied when titles are subdivided or amalgamated, or ARMA-funded fencing is erected. Changes in tenure also need approval from the Ministry for Planning.

Crown land along the river may be subject the Aboriginal Heritage Act (1972) and to native title claim.

There are areas of land which have been set aside as reserves, but not vested. Responsibility for this land is unclear.

Strategies:

- Wherever changes in titles occur adjoining the river, ARMA will seek to create a reserve along the river. The width of the reserve will be determined on a case-by-case basis, but should at least include the existing bushland along the river, plus any additional land to encompass the river channel and the adjacent floodway;



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- Where ARMA funds new fencing along the river, an management agreement will be entered into with the landowner, aimed at river protection;
 - ARMA will also seek to put in place a management agreement with all adjoining landowners aimed at enhancing river protection and recovery. These will be negotiated on a lot-by-lot basis with landowners.

- ARMA will continue to seek new funding to help upgrade management of riverside reserves.

Responsibility:

ARMA.

Timeframe: On-going.



4. Priorities

Eighteen major topics have been discussed in Section 3, and within each there are numerous tasks which need to be implemented. These need to be ranked, so that when work starts, the best return will be obtained for energy and funds invested.

During the preparation of this Recovery Plan, it became very clear that there are two over-riding priorities to be tackled: (i) the loss of the river pools and the threat to the river near Balladong and the Town Pool and (ii) raising the level of community concern about the river, and mobilising the community's resources towards river recovery. A range of other priorities fall below these two.

However, the designation of priorities does not mean that only one or two projects can proceed at once. On the contrary, it is envisaged that many of the projects listed below can be carried out in parallel, with different groups being involved.

There are two issues discussed in the plan which have a community-wide priority independent of this recovery plan: managing salinity, and drainage. ARMA will continue to cooperate with the bodies working on the action plans addressing these problems, and will apply them as necessary along York's river section. They are not listed as specific priorities below.

4.1 Highest priority work for York's Avon River

The two most important and highest priority tasks relating to the recovery of York's Avon River are:

1. Educating and enthusing the York community about river values in general and the specific needs for river recovery, promoting the new recovery plan and its policies and implementation and reporting to the community on programs and progress.
2. Reducing river velocity, and managing river sediments and sedimentation, especially to ensure the protection of Parkers Reach and the recovery of Railway, Cold Harbour and Mt Hardy pools.

It is recommended that both these projects start immediately, and that they should run concurrently.

4.2 Other priority works to be undertaken in parallel:

- Complete the river fencing and exclude uncontrolled livestock grazing from the river and the floodway.
- Institute improved, cooperative arrangements for fire management along the river, and on properties adjoining the river.
- Develop and implement a flood management/mitigation program for York townsite and along the river.
- Ensure the protection of the two most important pristine riverland areas: Parkers Reach and Gwambygin Park.
- Review chemical pollution, and institute measures to control point source pollution.
- Encourage the Shire to adopt the principles of Water Sensitive Urban design, and to manage stormwater and wastewater disposal in York town so that it does not pollute the river.
- Prepare a management plan for Avon Park and commence the development/management of Blands Pool and the Avon Walk as a self-guiding loop walking trail.
- Identify and start to control the worst invasive weed infestations.
- Organise a "Clean up the River" event, perhaps in conjunction with an annual River Picnic, and then put in place the strategies for maintaining a rubbish-free river.
- Carry out the survey of historical and heritage sites.
- Develop a strategic revegetation plan for the river and the valley, and start implementation.
- Develop the proposed new bushland recreation site at One Mile Pool.
- Cooperate in control programs for feral and pest animals, especially rabbits, foxes and cats.
- Ensure that biocides are not used in a manner that could damage the riverine ecosystem.

4.3 ARMA's priorities

ARMA's priorities are to approve the plan, set up mechanisms for implementation (see Section 5), secure funding and monitor and report on progress with implementation.



5. Implementation of the recovery plan

5.1 Primary force for promotion and oversight of the River Recovery Plan

The Avon River Management Authority will provide the leadership necessary to drive the implementation of this recovery plan. It will be done through the development of positive, cooperative arrangements between the following main groups:

- The Water and Rivers Commission;
- The Shire of York;
- The York LCDC;
- Relevant catchment groups;
- The River Conservation Society;
- Small Landholders Group;
- River neighbours and “Friends of the River” groups which might be formed;
- Any other community group likely to become involved in specific aspects of river recovery, for example bushfire personnel or Tourist Bureau; and
- Funding bodies within the Avon catchment and beyond.

The key role of ARMA will be to bring the right people together on projects, to assist them to work cooperatively, to help capture expertise and funds, to oversee standards, and to report back on progress.

Water and Rivers Commission staff, who support ARMA, will be responsible for the annual budgeting and works programs which will reflect the priorities established by ARMA in this Recovery Plan.

5.2 Involving the York community in plan implementation

ARMA wishes to involve the wider York community in the implementation of this recovery plan. This will consolidate local pride and community “ownership” of the river and widen the net of resources and energy

available for recovery projects.

This aim provides an opportunity to foster a wide-reaching rivercare ethic in York, and to provide mechanisms for all those with a stake in the river to have a voice, and an opportunity to contribute to river management and recovery. The aim will be to build on and coordinate current interests and expertise, not to develop new structures.

A number of interest groups and individuals with an interest in the river already exist, for example:

- The Shire of York which manages Gwambygine and Avon Park, is responsible for urban planning and urban wastes, including drainage and stormwater;
- The LCDC, which is seeking to improve land management and conservation in the Shire, and to whom the quality of the river is a prime indicator of progress;
- The River Conservation Society, which has focussed interest in the well-being of the river and remnant bushland, especially conservation and scientific aspects;
- Land owners (both rural and urban), who may, or may not be members of any formal group;
- The York Small Land Owners Management Group;
- Bushfire interests;
- The York Tourist Bureau, and other tourism interests who see the river as an attractive recreational and tourist feature;
- Aboriginal people, who have cultural links to the river and its surrounds;
- The York Society and others with historical and heritage interests;
- River neighbours, who usually view the river as part of or as an extension of “their” backyard;
- Other individuals who use the river, for recreation or pleasure.



No one group can represent all these interests. Nor do all groups have an interest in all aspects of river recovery and management. Many individuals who can contribute positively to river recovery do not wish to become part of a particular group.

ARMA's objective is to coordinate all these interests, and to ensure there is a forum from which no-one with a genuine interest in the river is excluded. The aim is to enthuse and mobilise as many people as possible, to provide them with guidance and expert assistance where necessary, and to ensure that they are working cooperatively on projects which enhance the river, as set out in this Recovery Plan.

The following approach is proposed:

1. The leadership role in recovery of York's Avon River will be taken by ARMA.
2. ARMA will strongly support existing organisations, for example the RCS and the LCDC, which are working to enhance river conservation and land management in the area.
3. ARMA will also support any new organisations which might arise spontaneously in the community to fill a particular need, and whose aims will result in an enhanced river, for example the Talbot Brook Land Management Association, Small Landholders Group or "Friends of the River" groups.
4. ARMA will bring together interest groups or concerned individuals to work cooperatively on recovery projects. The aim will be to see that the workload is shared and that specific tasks are taken on by the group or individual with the most appropriate skills. There are some projects which will be most appropriate for the River Conservation Society to take on; there will be other projects in which other groups will play the lead role (for example, local schoolteachers with educating schoolchildren, Bushfire Brigades with fire management, The York Society with heritage issues or the Tourist Bureau with tourism-related projects). Coordination and standards will be overseen by ARMA, and the story about river recovery will be spread by people from many organisations taking home reports of their contribution and the work of others.
5. ARMA will seek to keep the Shire of York well informed about all projects, and wherever appropriate, to involve the Shire in recovery projects and to encourage the Shire to support rivercare work.
6. ARMA will seek to keep all interested groups and individuals informed about work in progress. From time to time, a meeting of groups will be organised, so that issues can be discussed and cooperative-operative arrangements reviewed.



6. Plan review and reporting

Progress with the implementation of this River Recovery Plan will be reviewed annually, and a report prepared for presentation to ARMA.

A report on progress will also be made to the Shire of York, the York LCDC and the River Conservation Society. Articles on progress will be published in the local newspapers from time to time.

Five years after its adoption, the plan will be completely reviewed, with the purposes of:

- Marking off work which is completed;

- Adding in new work requirements, or amending strategies in the light of experience and research findings, or community views on the project;

- Reviewing priorities; and

- Updating any other aspect of the plan.

The York community will be asked to participate in this project.

ARMA will be responsible for triggering the review process and carrying it through to completion.



Appendix

Condition of Section 10

Avon River Channel Survey:
Volume 2

Prepared by Jonelle Black
for the
Avon River Management Authority

March 1997



PREFACE

The Avon River Channel Survey has been conducted in two parts. First, information about the condition of 191 kilometres of the Avon River (from the Avon Valley Nature Reserve to the Brookton Townsite) was collected by Ecoscape Pty Ltd and Jim Davies & Associates Pty Ltd. Secondly, the data collected in the field were entered into a computer system and analysed.

The results from this analysis are presented in two volumes. Volume 1 contains a single report that summarises all the data. It is designed to provide information quickly on areas of specific interest. Volume 2 contains a series of detailed reports, one for each section of the Avon River that was surveyed. These reports will provide a comprehensive base from which to develop management plans for the Avon River.

The following report concentrates on Section 10. It provides information on channel stability, vegetation condition and disturbances to the river foreshore. It also grades the sites within Section 10, allowing rehabilitation programmes to be directed towards sites in poor condition and conservation programmes to be orientated towards sites in good condition.



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1.0 GENERAL INFORMATION

For ease of management, the Avon River was divided into 18 sections spanning approximately 191 kilometres. Table 1 lists those features which form the downstream and upstream boundaries of each section. In addition, the major confluences and pools in each section are given in Table 2.

Table 1. Sections of the Avon River

Section	Downstream boundary	Upstream boundary	Distance (km)
1	Upper edge of Avon Valley National Park	Confluence with Jimperding Brook	11.23
2	Confluence with Jimperding Brook	Deepdale Road	8.14
3	Deepdale Road	Goomalling Bridge	9.16
4	Goomalling Bridge	Glen Avon Weir	11.30
5	Glen Avon Weir	Northam Pool Weir	17.45
6	Northam Pool Weir	Confluence with Spencer Brook	10.13
7	Confluence with Spencers Brook	Wiberforce Crossing	8.75
8	Wiberforce Crossing	Burges Siding	9.08
9	Burges Siding	Balladong Bridge	12.05
10	Balladong Bridge	Gwambygine East Road	11.40
11	Gwambygine East Road	Oakover	5.83
12	Oakover	Top of Beverley Road	12.09
13	Top of Beverley Road	Beverley Mawson Bridge	6.81
14	Beverley Mawson Bridge	Confluence with Avon River South branch	21.67
15	Confluence with Avon River South branch	Johnson Road	5.51
16	Johnson Road	Qualandry Crossing	12.17
17	Qualandry Crossing	Yenyenning Lakes	Separate assessment
18	Confluence with Avon River South branch	Brookton Townsite	18.46

Note: Section 2 is upstream of Section 1, section 3 is upstream of section 2.



Table 2. Major confluences and pools for each section of the Avon River.

Section	Confluences	Pools
1	Julimar Spring (3.0), Mortigup Brook (6.5), Munnapin Brook (8.0), Malkup Brook.	Cobbler (9.0), Long (10.5 - 11.0).
2	Jimperding Brook (2.5).	Diving (2.5 - 3.0), Deepdale (8.0 - 8.5).
3	Toodyay Brook (5.0), Boyagerring Brook (8.5).	Nil
4	Seven Springs (2.5).	Lloyds (2.0), Millard (3.0 - 5.0).
5	Mistake Creek (4.0), Wongamine River (13.5), Mortlock River (17.5).	Glen Avon (0.5 - 1.5), Katrine (5.5 -6.5), Egoline (7.5 - 8.5).
6	Spencers Brook (6.10).	Northam (0.5 - 1.0), Burlong (4.3 - 5.0).
7	Heal Brook (7.0).	Wilberforce (7.5).
8	Salmon Gully (5.0).	Mackie (3.5 - 4.0), Tipperary (8.5).
9	Nil	Tipperary (0.5 - 1.0), Meares (3.5), 5 Mile (?), York 1 Mile (9.5), York Town (11.0)
10	Bland Brook (0.5), Mackie River (6.5).	Mt Hardy (2.5), Cold Harbour (4.0).
11	Nil	Gwambygine (1.0 - 1.5), Fleays (5.5).
12	Dale River (6.5).	Brouns (4.5), Robins (10.0 - 10.5).
13	Nil	Speldhurst (2.0).
14	Wannering (6.0).	Beverley (0.5), Eyres (6.5 - 7.0).
15	Turkey Cock Gully (1.5), South and Eastern Branches of the Avon River (5.0), Monjerducking Gully (6.0).	Nil.
16	Bally Bally Gully (6.0).	Nil
17	Not assessed	Not assessed
18	Mangiding Brook (8.5).	Nil

Note: The number in parenthesis refers to the distance (in kilometres) at which the confluence or pool is located from the downstream boundary of each section.



2.0 CHANNEL STABILITY

2.1 Bank and bed stability

Within Section 10, approximately 76% of the river embankment was stable on both sides. In comparison, only 43% had a stable bed surface. Hence, along this stretch of the Avon River, the banks of the river were more stable than its bed surface. When taking all the sections into consideration, the number of sites with stable banks in Section 10, was higher than average. In contrast, the number of sites with a stable bed surface was lower than average (figures 1 and 2).

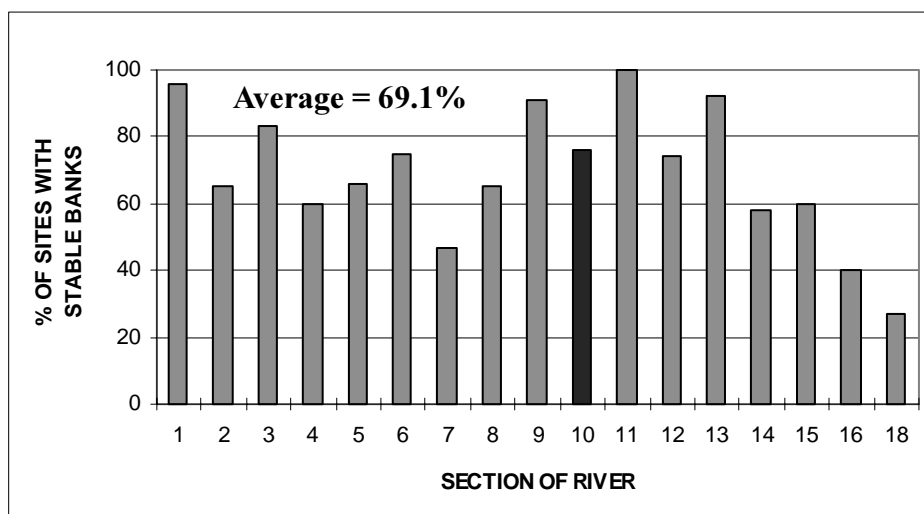


Figure 1. Bank stability along the Avon River.

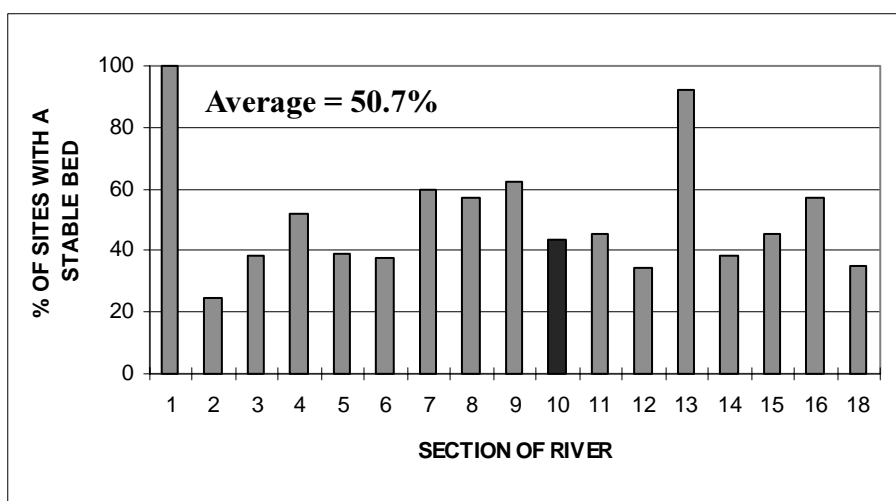


Figure 2. Bed stability along the Avon River.



2.2 Channel features

It is important to note the geomorphological features of a river channel in order to determine whether the channel is eroding, accreting or in dynamic equilibrium. In Section 10, 38% of the sites were neither eroding or accreting. Of the remaining sites, 24% contained scour channels, 33% contained sand slugs, while 5% contained both scour channels and sand slugs. Compared to other sections of the Avon River, Section 10 had a moderate number of scour channels and a high number of sand slugs (figures 3 and 4).

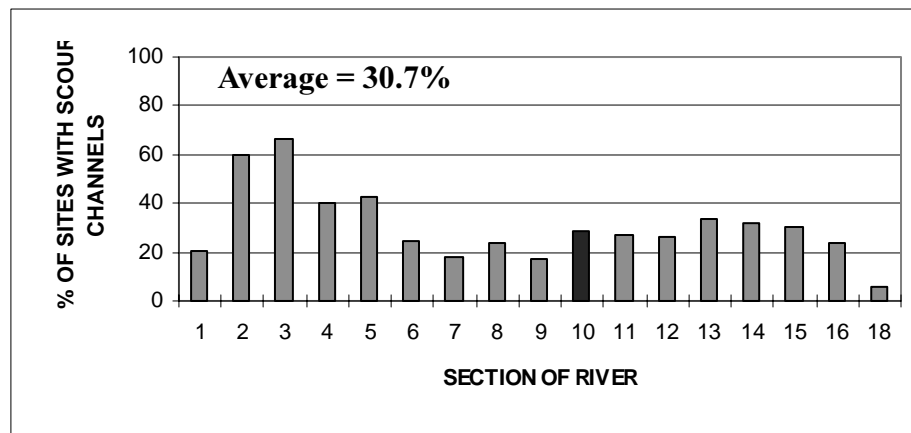


Figure 3. Scour channels along the Avon River.

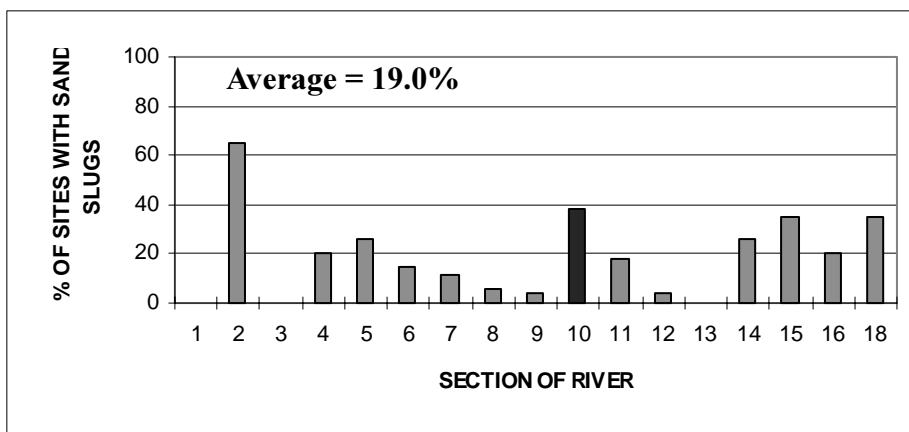


Figure 4. Sand slugs along the Avon River.



3.0 VEGETATION CONDITION

3.1 *Presence, health and regeneration of common overstorey species*

The three overstorey species found along the Avon River (ie. *Eucalyptus rudis*, *Melaleuca raphiophylla* and *Casuarina obesa*) were identified at nearly all the sites. In general the overstorey was healthy, however further research is necessary to determine whether the regeneration rate for each species is equivalent to that which naturally occurs (figure 5).

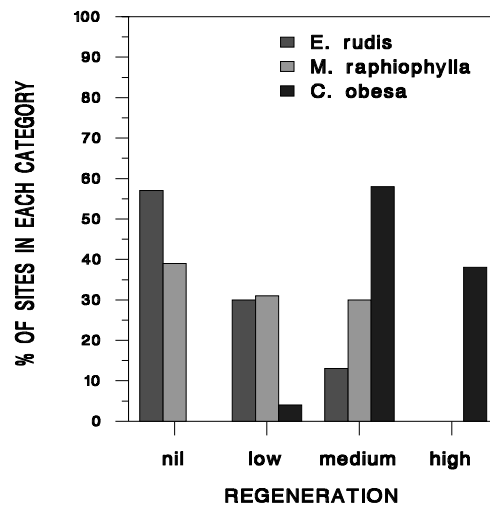


Figure 5. Regeneration of common overstorey species in Section 10.

3.2 *Problem weeds*

Problem weeds identified in Section 10 were Tamarisk (5% of the sites) and Olive Trees (10% of the sites).



4.0 DISTURBANCE FACTORS

4.1 *General disturbances*

At the time of the survey, 24% of the sites in Section 10 had stock in the Avon River. This figure was low in comparison to other sections of the river (figure 6). In addition, 10% of the sites had been disturbed by feral animals.

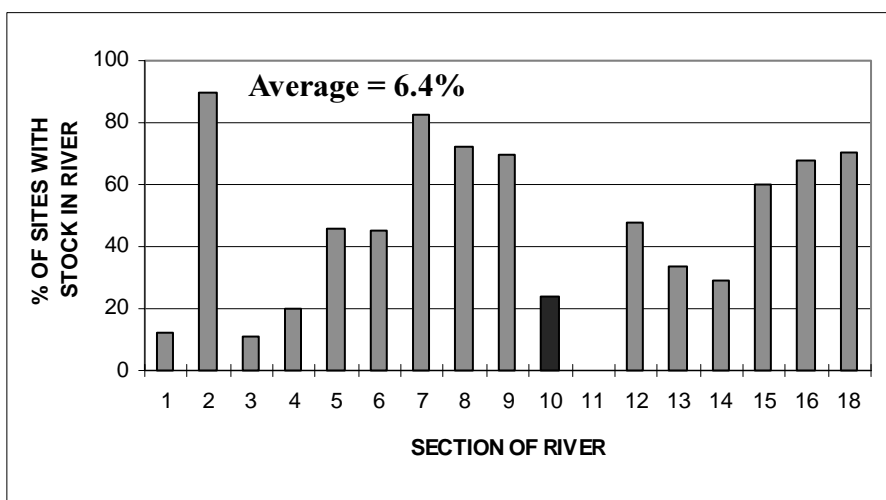


Figure 6. Rubbish dumping along the Avon River.

4.2 *Fencing Status*

Within Section 10, 81% of the sites were fenced on both sides of the river. Of the remaining sites, 19% were fenced on one side of the river, while no sites were not fenced on either side. Compared to other sections of the Avon River, Section 10 had a high amount of fencing (figure 7).



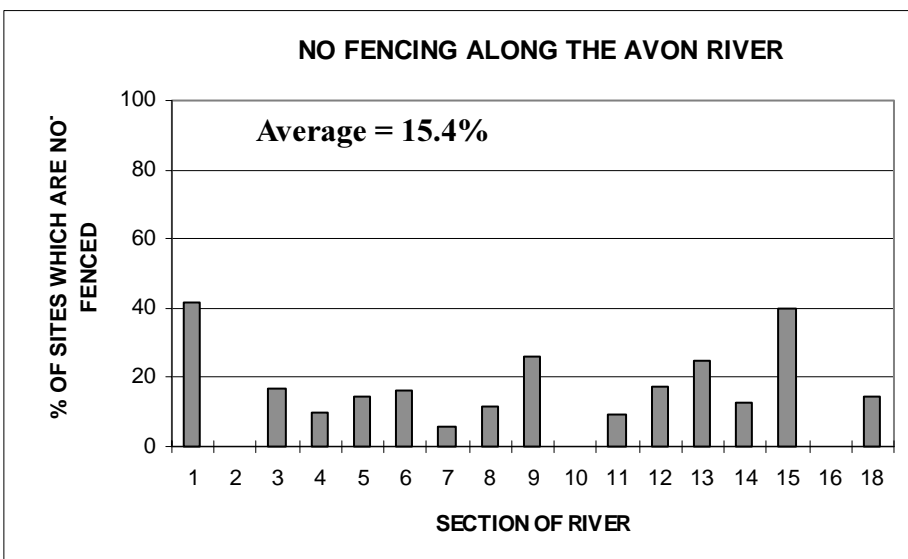
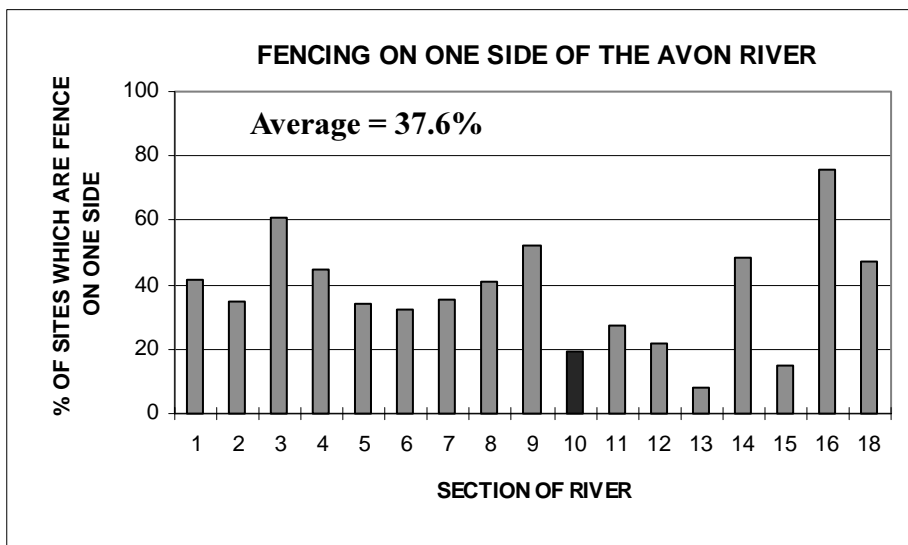
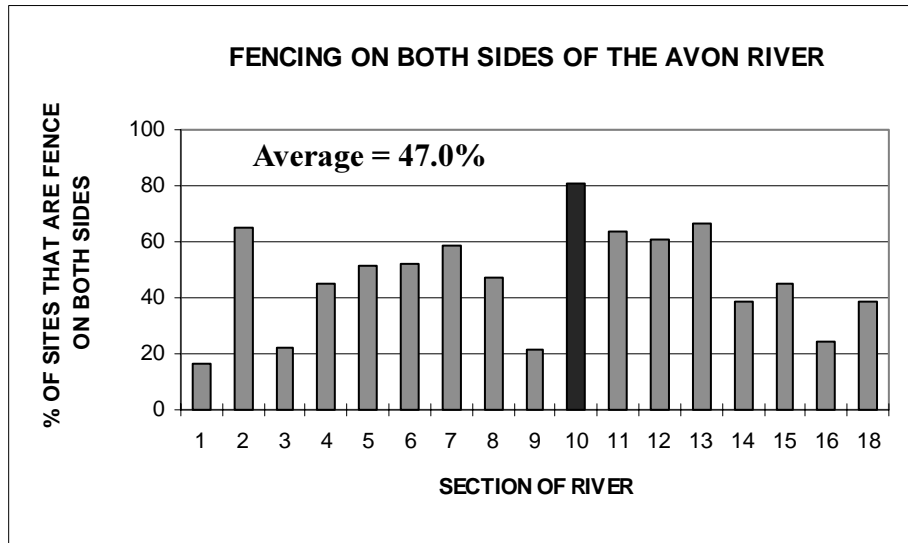


Figure 7. Fencing status along the Avon River.



5.0 GENERAL CONDITION

5.1 Channel and foreshore assessment

In Section 10, the general condition of the channel was variable, ranging from C1 to D (see appendix A). However, most of the channel was in categories C2, C3 and D, indicating that its banks and bed surface was unstable in many places. The general condition of the foreshore ranged between B2 and C2, but was mainly B3 (see appendix A). This indicates that the foreshore was largely dominated by weeds.

5.2 Condition of individual sites

To determine the general condition of each site, a weighting system was developed to take into account the different variables that were measured in the survey. Those variables that indicated that the site was in a poor condition (eg. scour channels and sand slugs) were assigned a high value, such as 5. Those variables that indicated that the site was in a good condition (eg. stable bed surface and banks) were assigned a low value, such as 1. An overall weighting was obtained for each site by summing these values. Hence, a site with a *low* overall weighting would be in a better condition than a site with a *high* overall weighting (figure 8).

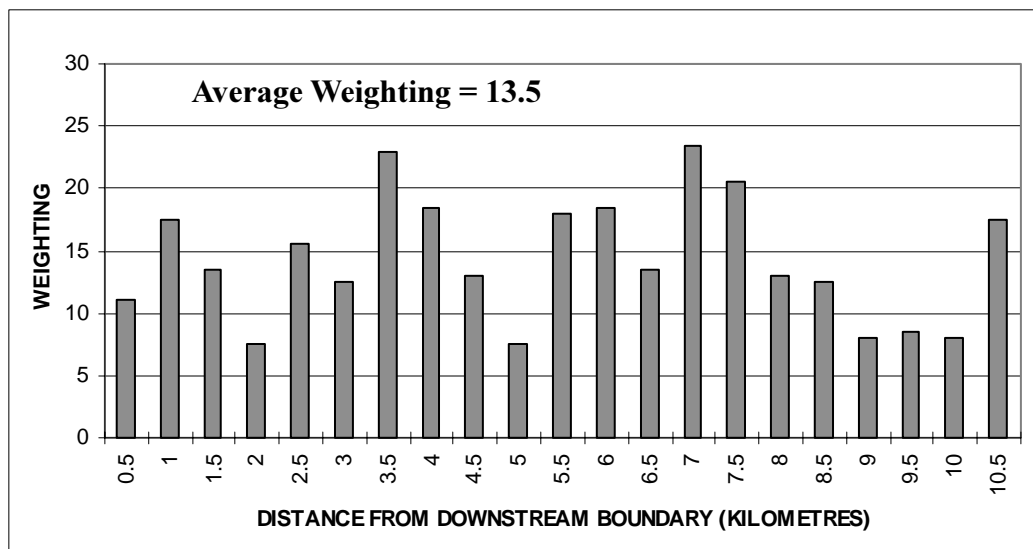


Figure 8. Condition of sites within Section 3.



6.0 CONCLUSION

The development of river recover plans for each section of the Avon River, and their subsequent implementation, will require commitment from both government departments and the local community. The Avon River Channel Survey, has clearly indicated that some sections of the Avon River are in a degraded condition. Hence, it follows that in the process of writing river recovery plans for the Avon River, these sections should be given priority.

To meet this objective, the sections were ranked according to their average weighting (as calculated in 5.2). From table 3, it can be seen that Section 10 may be considered a moderate priority for a management plan.

Table 3. Ranking of sections along the Avon River.

<i>Ranking (from worst to best)</i>	<i>Sections</i>	<i>Average Weighting</i>
1	2	19.6
2	18	17.4
3	15	16.0
4	16	15.4
5	14	15.3
6	5	14.7
7	6	14.5
8	7	14.4
9	10	14.3
10	81	4.2
11	4	14.0
12	3	13.5
13	12	12.2
14	1	10.6
15	9	10.5
16	11	10.3
18	13	9.0



CHANNEL CONDITION

<i>Channel Type</i>	<i>Rating</i>	<i>Description</i>
Untrained	A	Stable banks and bed surface.
“	B1	No bank erosion; small areas of unconsolidated bed sediments.
“	B2	Bank erosion; unconsolidated bed sediments; minor sand slugs.
“	B3	Undercutting of banks; large sand slugs.
Trained	C1	No bank erosion; majority of sand deposits are consolidated.
“	C2	Bank erosion; only large sand deposits are consolidated.
“	C3	Scour channels; most sand deposits are not consolidated.
“	D	Unstable banks and bed surface.

FORESHORE CONDITION

<i>Rating</i>	<i>Description</i>
A	Pristine (ie. only minor disturbances to vegetation).
B1	Degraded; understorey is weed infested.
B2	Degraded; understorey is heavily weed infested.
B3	Degraded; understorey is weed dominated.
C1	Erosion prone; understorey only weeds, with areas of exposed soil.
C2	Eroding; understorey only weeds, with areas of surface erosion.

