OVERVIEW

1. INTRODUCTION

In 1998, faced with problems such as salinity, acidity and poor water quality, the Little River Landcare Group (LRLG), from the Macquarie Valley in Central Western NSW, applied for Natural Heritage Trust (NHT) funding to develop the Little River Catchment Management Plan (hereafter referred to as catchment plan) for their catchment. The group then appointed consultants, Donaldson Planning & Management Services, to assist with the process. This report is the second stage (of three) in the development of that catchment plan.

The **Stage 1** report described the natural resources of the catchment and their current condition. The Executive Summary from that report is reprinted at the end of this Chapter for ready reference.

With the aim of addressing natural resource degradation, **Stage 2** (this report) will:

a) Prioritise the issues;
b) Present resource management objectives;
c) Provide recommendations about land use;
d) Present and prioritise a range of coordinated on-ground activities and strategic actions
e) Provide a monitoring framework to gauge how changes in management are contributing to the goals and objectives defined in the plan.

Stage 3 will include an economic analysis of the proposed plan, review the interim plan presented in Stage 2 in light of the costs and benefits, and will explore possible administrative arrangements and procedures to implement the catchment plan, as well as provide guidelines for sharing the responsibilities and costs associated with the plan.

1.1. *Stage 2 Planning*

1.1.1 The Process

The LRLG Steering Committee wanted to ensure that the following approach was adopted during the course of developing the catchment plan. These values have driven the planning process and, ultimately, are reflected in the final report:

- Ensure widespread community participation, including local government;
- Consult regularly, including reporting to the committee and community;
- Include all the community - not just Landcare groups;
- Bring a focus to the work of agencies and universities across central western NSW;
- Provide direction for the next 100 years, and put into place plans for the next 10 years;
- Set priorities for action within the catchment;
- Identify ways to provide support for implementation in critical areas;
- Establish benchmarks and monitoring programs so progress can be evaluated;
- Provide the necessary information to enable negotiation with governments;
- Develop an investment strategy to attract resources from private and public investors;
- Achieve fairness and equity across the catchment.

The planning process has been community driven throughout. The LRLG Steering Committee has managed the overall project, and has met regularly with the consultant to provide input and direction and to approve the recommendations.

The recommendations in this report are based on extensive consultation, including workshops with researchers, advisers, and local farmers, followed by public meetings with landholders across the catchment. This process was also overseen by the Steering Committee.

The Steering Committee has also developed a consultation strategy to help market the plan. This will target all stakeholders, from the local farmers and villagers, to the Commonwealth, State and Local governments, and corporate bodies who can offer sponsorship.

Originally, implementation was proposed over a fifteen (15) year period. This has since been revised to a ten (10) year timeframe. This decision was partly driven by other strategies such as the Murray Darling Basin Commission's (MDBC) Salinity and ICM Strategies, and the NSW State Salinity Strategy - all of which will directly impact on the Little River Catchment. Above all though, it was felt that further irreversible damage could be caused if the necessary changes were not implemented within the next decade.

1.1.2. Terms of Reference for Stage 2

During Stage 2, the Steering Committee, together with the local people in the district, the consultant and other local advisory staff and experts, considered the following questions:

- Which are the priority areas on which to start work?
- What are the best solutions to the problems (i.e. Best Management Practice)?
- Are these solutions feasible and acceptable?
- How much can farmers afford to pay?
- Who else has some responsibility to pay?
- What incentives are needed for people to change?
- How will the proposed changes affect our communities?
- What skills and training are required to help people implement the proposals?

The full Terms of Reference are outlined in Attachment 1.1.

1.1.3. Putting Planning into Practice

The catchment plan has been developed for the catchment scale, so the recommendations are more general than would be the case for a property plan. For example, catchment recommendations are based on land management units, at a scale of 1:100,000, whereas a farm plan is usually produced at a scale of approximately 1:10,000. Planning at this scale allows catchment managers to determine the extent of change required, and helps to pinpoint where certain land uses are the most appropriate. It can also be used to estimate the implementation costs for the entire catchment. It does not, however, suggest that the areas delineated are uniform or homogeneous, as every farmer would be aware.

While catchment planning provides a framework for improving natural resource management, implementation depends on individual landholders being willing to adopt the changes required to improve catchment health and productivity. Landholders must therefore have a good understanding of their own resources, and the variation and condition on each property.

Implementation also requires further planning at the individual property level. While many farmers have undertaken some farm planning in the past, the greatest value will be derived from this catchment plan if farmers review and revise, or develop, their individual property plans in light of overall catchment recommendations.

In reality though, social and economic constraints can (and do) seriously limit the ability of both groups, and individuals to implement change. With this in mind, this plan should serve as a valuable negotiating tool to attract support from the government and other investors. This support will help landholders to address issues of catchment significance and to implement appropriate management practices, particularly those with off site, or public, benefits for the Little River Catchment and further downstream in the Macquarie River and Murray Darling Basin.

However, this external support is not appropriate in cases where the benefits are limited to the individual landholder, with no significant public benefit. This plan does not deal at any length with these issues - however, there are some on-farm Best Management Options (in Chapter 6) that will largely result in private benefit, and are considered the responsibility of the landholder to invest in eg. reversing nutrient decline.

Irrespective of what the final catchment plan looks like, it must be dynamic ie. it must be continually updated, evaluated and reviewed. New initiatives, such as the "TARGET" funding projects, Prime Minister's National Action Plan for Salinity and Water Quality and finalisation of the State and MDBC Salinity strategies (see Chapter 2) are likely to bring new tools and information to light. The LRLG Steering Committee should regularly review and revise the plan with this in mind.

Executive Summary - Stage 1 Report - Little River Catchment Plan
Catchment Description and Situation Statement

A series of four community consultation meetings were held across the catchment to help identify landholder concerns. These raised environmental issues, as well as concerns about economic pressures and the changing social fabric of the community, and are summarised in the table below.

Table 1.1: Issues of concern to the Little River Catchment community.

ISSUE	Type #	No. times raised in Stage 1 Consultation
Dryland salinity	B/S	14
Soil acidity	B/S	11
Soil erosion (and inappropriate earthworks)	B/S	8
Soil fertility and structure decline	B/S	2
Poor groundwater quality (iron, septic, salt)	B/G	5
Limited access to groundwater	B/G	1
Poor surface water quality (salt, nutrients, sediment)	B/W	3
Inequities in access to surface water (irrigation allocations, water harvesting, stock water)	B/W	3
Alien fish numbers (carp)	B/W	4
Riparian zone degradation (siltation)	B/W	1
Native vegetation decline (dieback, biodiversity)	B/V	9
Weed invasion	B/V	8
Pasture degradation	B/V	4
Pest animals (feral and native)	B/V	4
Climate variability	B	2
Low commodity prices	E	11
Low profitability	E	5
High cost of sustainable agriculture	E	2
Poor transport infrastructure (road, rail)	E	8
Livestock diseases eg Ovine Johnes Disease	E	1
Inappropriate government policy (vegetation, water)	So	13
Loss of rural services (closure of government and institutional services)	So	9
Limited employment opportunities	So	9
Inadequate skills base/education including marketing skills	So	7
Aging farmers/lack of estate planning	So	2
Lack of community cooperation	So	1

B= Biophysical, S= Soils, G= Groundwater W= Water, V= Vegetation, So= Social, E= Economic

Based on the outcomes of this consultation process, the LRLG Steering Committee decided on a long-term vision, and a set of goals, which define the improvements they plan to achieve within the catchment over the next ten years.

The vision for the Little River Catchment is:

" a healthy, productive and diverse biological and social environment"

1.2.1 Catchment Description

1.2.1.1. The Little River Catchment

The catchment plan area covers all the Little River Catchment - plus a small part of the Bell River Catchment, particularly the Curra Creek and Eurimbla districts. For planning purposes, the Little River Catchment has been divided into four sub catchments.

Sub catchment	Baldry	Cumnock	Suntop/ Arthurville	Yeoval	TOTAL
Area (ha)	111 134	43 990	66 932	36 266	258 322
Percentage %	43	17	26	14	100

The plan area is situated almost completely within the Cabonne, Wellington, and Dubbo City Local Government Areas. Local Government has a key role in maintaining the physical and economic resources, and the social fabric of local communities.

Local Government Area	Cabonne	Wellington	Dubbo	Parkes & Narromine
% Catchment	62.8	28.4	8.6	0.2
% Shire	27.0	18.0	6.7	~0

The area straddles the boundaries between "northern" and "southern" NSW, including most State agencies and political administration boundaries, making the coordination of services especially challenging.

1.2.1.2. Geology and Soils

Little River Catchment is located on the highly complex Lachlan Fold Belt, much of which was laid down in a marine environment. Some rocks contain naturally high levels of salt, which can be released when the rain infiltrates through the soil and into the rock formations.

Soils in the area are also highly variable as they are strongly influenced by geology. They are mostly old, with low to moderate fertility, poor soil structure and are prone to becoming acidic with prolonged cropping, unless lime is applied.

1.2.1.3. Land Capability

Land needs to be used according to its capability, if degradation is to be avoided. Problems such as erosion, poor soil structure, acidity and salinity are the result of using the land for more intensive production than it is capable of maintaining. Eventually, the long-term costs may exceed the short-term economic gains, or worse still - the land will no longer be suitable for farming and may not be available for productive use by future generations.

The majority of the cropping land is in the east of the catchment, while most of the Baldry sub catchment, to the west, is best suited to grazing and timber. However, much of the cropping country has been cleared to levels well below recommended tree cover for the land class, with little or no timber remaining. This has impacted on land degradation and reduced production, particularly during the grazing phase of a mixed farming rotation.

Areas of Land Capability by Sub catchment (ha)

Sub catchment	Baldry	Yeoval	Cumnock	Suntop	Total
Cropping Classes 1-3	22901.5	26654.3	32003.6	51553.4	133112.8
Grazing Classes 4-6	59456.8	9379.3	10846.1	10108.3	89790.5
Timber Classes 7-8	28775.5	232.5	1140	5270.9	35418.9

1.2.2. Condition of the Resources

1.2.2.1 Dryland Salinity

Despite Little River Catchment being rated a high risk for salinisation and a significant contributor of salt to the Macquarie River, there is little information on how the ground water system functions, or in identifying areas at risk. Monitoring is also inadequate to track changes in the watertable levels or instream salinity. A preliminary study of Standing Water Levels around Wellington indicates that there have been average rises of 1.6 metres over the last ten years i.e. 16 cm closer to the ground surface every year.

Dryland salinity occurs when the salts in the soils and rocks are brought to the surface by rising watertables. Rising watertables are the result of water draining through the soil (deep drainage) into the groundwater system (recharge). If there are no dissolved salts in the water, the result is waterlogging, not dryland salinity.

Clearing of trees, fallowing for annual crops and lack of perennial grasses in pastures all allow deep drainage and subsequent excess recharge. Acidity worsens the situation by reducing plant vigour and growth.

In the Little River Catchment, saline seepages often occur at the break of slope. These are commonly associated with changes in soil type, where heavier clays are found lower on the slope. The soil water cannot move through clays as easily as sandy and loamy soils, so water accumulates and is forced up to the surface.

While major geological structures within the catchment may permit subregional movement of water, preliminary studies suggest that dryland salinity is due to local geology and soil conditions in most of the affected locations. Local systems mean that changes to landuse, by small groups of farmers within the immediate vicinity of the salinity outbreak, can prevent further salinisation and may be able to reverse current degradation.

The area known to be salinised within the Little River Catchment has increased four-fold in the last decade and is continuing to grow.

Area of Dryland Salinity Outbreaks (ha)

Subcatchment	Baldry	Yeoval	Cumnock	Suntop	TOTAL
1988	274	173	269	358	**1074**

1998	*779	859	1180	1590	**4408**

** only 49% of the Baldry subcatchment mapped in 1998*

In the 6 months between December 1998 and May 1999, an average of 400 tonnes of salt/day passed through Dubbo in the Macquarie River, of which Little River contributed approximately 12%. The situation is worse in winter due to the retention of upper catchment water in Burrendong dam, because most of the flow in the upper Macquarie River comes from the Talbragar and Little Rivers (both highly salinised), and the Bell River.

Work undertaken by the Central West Catchment Management Committee (CWCMC) has rated Little River as having a Very High Salinity Hazard.

The Murray Darling Basin (MDB) Salinity Audit painted the grimmest scenario for the Macquarie River of all the NSW inland rivers. It predicted that by 2020, the salt load would have almost reached the 1500 EC threshold. By 2050 it will have far exceeded this level and Little River will be contributing 50 t/day of salt into the Macquarie River. This will seriously limit options for consumptive use, restrict irrigation and affect the aquatic environment.

Given these impacts, dryland salinity in the Little River Catchment is currently estimated to cost $1.7 million per annum. This figure does not take into account the offsite impacts eg. in the downstream irrigation areas, costs to local councils such as Dubbo who are already suffering road and infrastructure damage, or losses in the wetlands. These costs are predicted to rise in the future.

Cost of Dryland Salinity in Little River Catchment ($)

Type	**Farmers**	**Households**	**Businesses**	**Councils**	**Agencies**	**TOTAL**	**Reduced Property Values**	**TOTAL**
Annual Cost $	770 743	177 943	39 097	74 188	392 816	**1 454 786**	212 777	**1 667 563**
%	46.2	10.7	2.3	4.4	23.6		12.8	**100**

1.2.2.2 Soil Acidity

Acidity is a naturally occurring process caused by acids in rain or from soil biological processes. The loss of nitrates through leaching and removal of alkalis through produce harvest ie. hay and grain, as well as the effect of pasture improvement with annual legumes, has resulted in severe acidification throughout some parts of the catchment.

The situation is predicted to continue to worsen if liming is not implemented to counteract both the natural acidification processes and farming impacts. Liming should begin prior to topsoil acidification becoming severe, or subsoil acidity developing. If subsoil acidity is present, it is very difficult to reverse and the cost of raising the soil pH is unlikely to be recouped.

Different land uses affect the pH of soils to varying degrees eg. the removal of 1 tonne of lucerne is 20 times more acidifying than 1 tonne of grain.

Soil acidification impacts directly on productivity, and also reduces plant vigour and growth. This can result in significant deep drainage, subsequent rises in watertables and salinisation, and can also create a high erosion risk.

In the Little River Catchment, acidification is generally worst in shallow soils, red podzolics, and siliceous sands. Moderate acidification can also be a problem in red brown earths and non-calcic brown soils; the main cropping soils.

Nine Landcare groups across the catchment have been collecting Acid Action data. The results showed that decreasing pH was associated with increasing Exchangeable Aluminium, which is toxic to plants. pH readings as low as 4.0 were recorded in most groups, with the Saddleback area having the lowest average pH (4.17). Results for Saddleback, Yahoo Peaks, Burgoon, Yeoval Central, and Baldry all showed an average topsoil and subsoil pH of less than 5.0.

Some very preliminary estimates indicate that the initial cost of liming may be as much as $19 million to reverse the existing trends within the catchment.

1.2.2.3 Soil Erosion and Structure Decline

Erosion incurs significant costs to agricultural production, due to nutrient losses, poor access, and the need for on-farm remedial works. It also incurs high offsite impacts including the cost of siltation of roads, poor water quality affecting pumping capacity for irrigators, and added treatment costs for urban water supplies.

A major cause of erosion in cropping country is poor soil structure brought about by continual cultivation and machinery compaction, low fertility and the removal of stubble residues to protect the soil surface.

Grazing land can also suffer from poor soil structure due to set stocking, which can result in compaction, limit root development, and subsequent improvement to soil structure. Overgrazing, as well as soil acidification and dryland salinity, reduces ground cover and can subsequently increase the risk of erosion.

The most recent estimates of the extent of erosion in the Little River Catchment come from surveys in the late 1980s. These show that 36% of the catchment is subject to sheet and rill erosion. The same survey showed that Little River was the second most degraded area in the Macquarie Valley, after the Bathurst district.

Sheet & Rill Erosion in Little River (ha)

Minor to Moderate Rill Erosion	Severe to Very Severe Rill Erosion	Minor to Moderate Sheet Erosion	Severe to Very Severe Sheet Erosion	Erosion caused by salinity
1188	364	72141	18724	1074

Gully Erosion in Little River (km)

Minor	Moderate	Severe	Very Severe	Total
122.5	87.9	156.7	126.2	493.2

1.2.2.4 Water Quality

Little River and Bell River are the only two major tributaries that flow into the Macquarie downstream of Burrendong Dam before the Talbragar River enters at Dubbo. This is significant, as these waters make up most of the stream flow during the winter months when water is being collected in the dam for irrigation purposes.

Both Talbragar and Little River carry high salt loads so, following periods of high flow in these tributaries, there is a rise in the salt concentration in the Macquarie. This is a serious issue to town water supply, downstream irrigators, and the integrity of the Macquarie Marshes.

The Murray Darling Basin Commission (MDBC) estimates that by 2020 there will be 508,400 tonnes of salt a year flowing in the Macquarie River. One third of this will be pumped onto irrigation land and almost half will end up in the Macquarie Marshes. Action in the upstream catchments, with the help of the downstream users, is required immediately to prevent this scenario.

There is virtually no water quality monitoring on Little River, with only one gauging station at Obley, and no measurements taken at the point of entry into the Macquarie River. Current data has been gained by analysing records from sites on the Macquarie River.

Fate of Salt Loads in the Macquarie River at Narromine (000's tonnes)

	1998	**2020**	**2050**	**2100**
Irrigation Diversions	77.9	169.9	225.4	271.8
Wetland & instream losses	111.6	243.3	322.8	389.3
Stock & Domestic Use	1.0	2.2	2.9	3.5
Flows to the Darling R	43.9	93.1	126.4	154.3
% Wetland health threshold exceeded	<5	10	15	20
TOTAL in River	**234.4**	**508.4**	**677.4**	**818.9**

Little River is rated as moderately stressed due to water extraction levels. Unregulated surface water licenses from Little River and its tributaries are available for approximately 430 hectares of irrigation, while 1100 hectares of land is irrigated from the Macquarie River within the catchment area. Additional licenses draw groundwater from the shallow alluvium near the junction of the Macquarie and Little Rivers.

Moderate phosphate levels instream, probably due to phosphate fertiliser applications and sedimentation, sometimes cause algal outbreaks.

Contamination of groundwater from septics in the village of Yeoval is a serious concern to both Local Government and residents. This is particularly apparent during winter when watertables reach the ground surface.

1.2.2.5 Riverine Environment

NSW Fisheries regard Little River as a "special place", with abundant stocks of native fish. It is rated as having a high conservation value in order to protect these stocks, which are thought to be adapting to changes in river conditions. Fortunately, limited cropping along most of the river has kept chemical pollution to a minimum. NSW Fisheries considers carp numbers to be no worse than many inland rivers and considerable stretches of river are quite clear and suitable for native fish breeding. However, local residents cite carp as being in large numbers and damaging to stream health.

Vegetation along much of the river system is generally degraded, (due to clearing and grazing), and weeds are a problem in some areas eg Barneys Creek. Typha and cumbungi, signs of saline waters, are found in many creeks.

The stability of the bed and banks of Little River and its tributaries varies considerably. In some sections, such as below Balrudgery and Buckinbah Creeks, and in Tuckwell and Chain of Ponds Creeks, the bed is quite unstable. Streams such as Sandy Creek and Doughboy Creek have suffered considerable bank damage due to livestock frequenting the river. Continual stocking is preventing regeneration along the riparian zone and adding to bank instability. Loombah Creek shows a lot of algal growth, suggesting high nutrient levels.

1.2.2.6 Tree Decline

Prior to European settlement, the district was generally covered with savanna woodlands and forests were found only in the limited higher rainfall areas. Clearing for agricultural production began on the lower slopes and thinning was later undertaken in the steeper country.

The only remaining large tracts of timber are on the infertile soils on steep slopes, mostly on Crown Land. The percentage of land covered with green timber is generally well below the levels recommended for long term sustainability and what remains is generally highly fragmented and degraded. Almost the entire understorey has been removed by grazing and this has substantially changed the pasture composition.

Habitat fragmentation can lead to reduced growth rates, breakdown of natural processes, tree death and the loss of fauna. Although many trees are old and will die in the near future anyway, this process is being hastened by the degraded nature of the ecosystem.

Tree decline is associated with rising water tables, salinity, soil structure decline, erosion, declining water quality, reduced agricultural stability and productivity, loss of habitat for wildlife and diminishing economic returns. A number of threatened fauna species are predicted to occur within the catchment area.

1.2.2.7 Pasture Degradation and Weeds

Overstocking and continuous grazing, along with difficult seasons, have resulted in degraded pastures in much of the catchment. Best management practice recommends that ground cover levels should be at least 70% in native grasses and higher in improved pastures all year round to avoid erosion, deep drainage and weed invasion, and to maximise plant and animal production. Pastures dominated by annual species, whether desirable legumes or weeds, do not achieve these objectives.

Various weeds have invaded pastures. Broadleaf weeds and thistles occur widely, but are not really perceived as a major concern by graziers. Eurimbla and Yeoval Landcare Groups report burrs as an issue. Unpalatable grasses are a problem in some areas, whilst *vulpia* is increasing in the Hervey Ranges area. Obley Landcare Group reports production impacts due to Heliotrope, St Johns Wort and Horehound.

Woody weeds are also only considered to be a slight problem, with blackberry and boxthorn the two main species. Pests such a rabbits and foxes are associated with woody weeds and can cause significant production losses eg. to wool quality.

Although crop weeds are seen as a moderate problem across the catchment, farmers regard them as being part of the farming system - not as a resource management issue. Crop weeds including grasses and thistles, turnips and other broadleafs, are increasing.

Local Councils are very concerned about the spread of noxious weeds, particularly along the rivers. Cooperative action by farmers and all councils is required to achieve control of difficult weeds.

1.2.3. Geographic Information System

Information on soils, acidity, geology, land capability, landuse, vegetation, saline sites, streambank erosion, sheet and rill erosion and gully erosion has also been placed on a computer based Geographic Information System (GIS), at the Department of Land and Water Conservation (DLWC) office in Wellington. It is hoped that catchment managers will use this information to help make decisions about the catchment and its management. Additional information can be added as future decisions are made, as well as to track the implementation of the plan.