CHAPTER 2: THE MYPONGA RIVER CATCHMENT

2.1 Introduction

This chapter provides an overview of the characteristics of the Myponga River catchment. Knowledge of the events of the past is important in the understanding the current condition of watercourses in the Myponga River catchment. The current state of watercourses in the Myponga River catchment is largely the result of land-use changes since settlement. These include vegetation clearance, swamp drainage and channelisation, and grazing. These changes are still going on today.

2.2 Catchment description

2.2.1 Location and size

The Myponga River catchment is situated 50 km south of Adelaide and covers an area of approximately 140 sq km (Figure 2.1). It is covered by the Local Government Areas of Alexandrina Council, City of Onkaparinga, District Council of Victor Harbour and the District Council of Yankalilla. The main channel of the Myponga River originates near the intersection of Pages Flat Road and the Adelaide to Victor Harbour Road and flows in a south-westerly direction to enter the Myponga Reservoir. Below the reservoir, the Myponga River flows in a westerly direction to enter Gulf St Vincent at the southern end of Myponga beach.

The project area covers the Myponga River catchment above the reservoir (approximately 124 sq km). There is 17 sq km below the reservoir which was not surveyed as part of this project due to time and resource constraints.

2.2.2 Topography

The altitude within the Myponga River catchment ranges from sea level to over 400 metres. The most prominent peak is Myponga Hill (440 m). The landscape of the catchment varies from very steep slopes associated with the Sellicks Hill Ranges to the broad flat floodplains of the glacial valleys. To the east of the Myponga Reservoir, the landscape is characterised by low relief grading to undulating in the north-east. To the south-east of the reservoir, the landscape rises to steep hills (Figure 2.2).

The main channel has a low grade and, over a length of 16.5 km, the channel has a fall of only 80 m (slope approximately 0.6%). Figure 2.3 is a longitudinal profile of the main channel from the top of the catchment to the reservoir.

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Figure 2.1: Location

Myponga River catchment

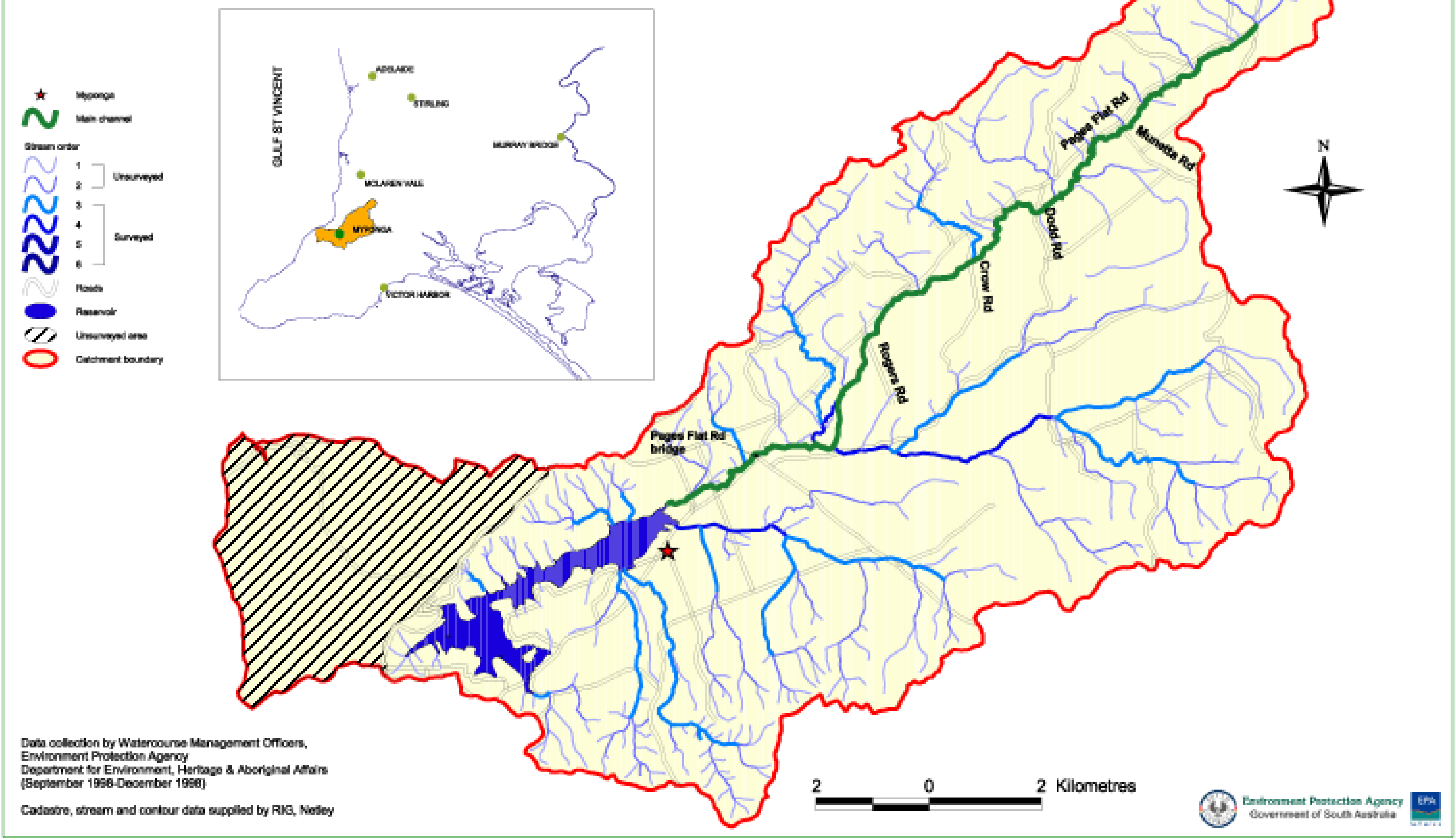
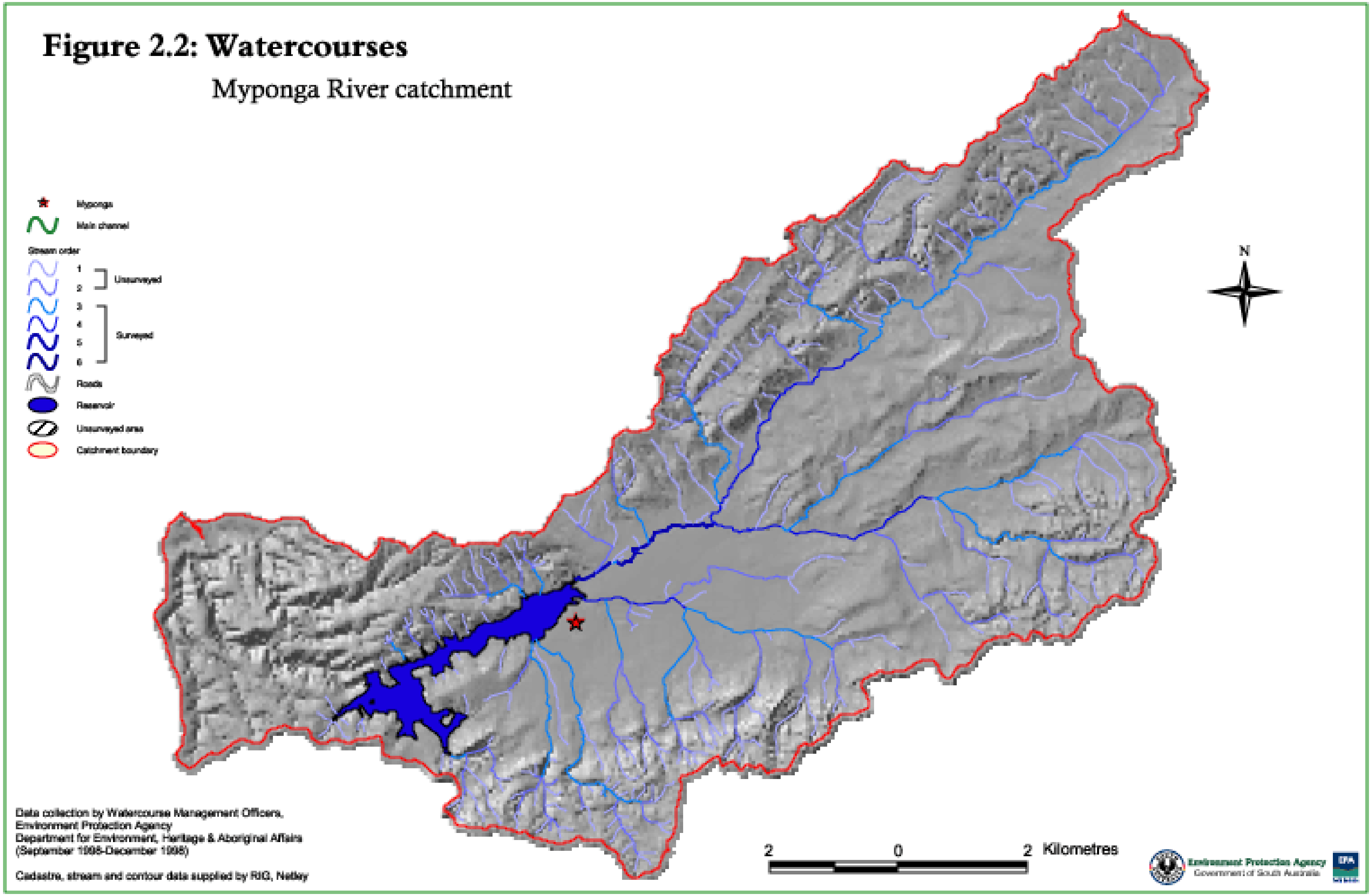


Figure 2.2: Watercourses

Myponga River catchment



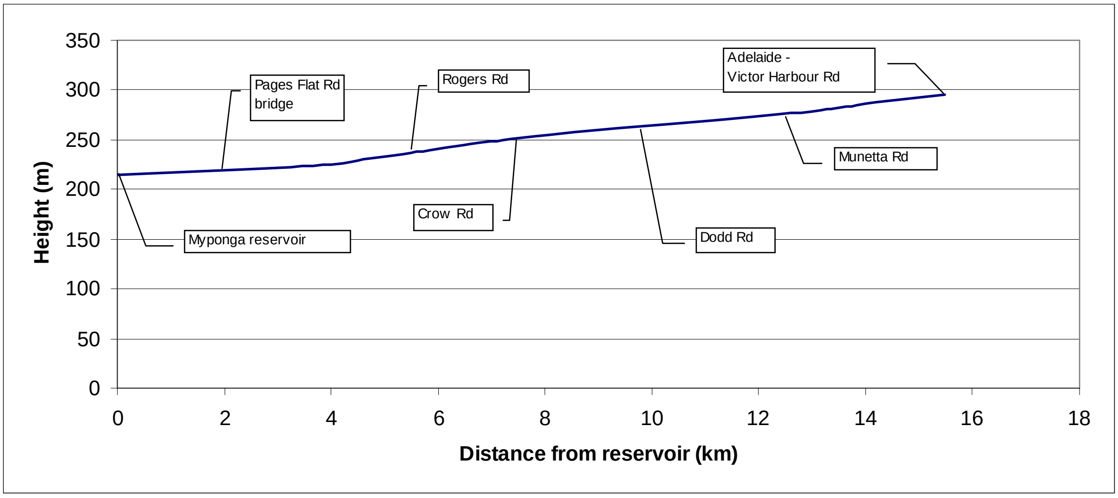


Figure 2.3 Longitudinal profile of the main channel upstream of the reservoir

2.2.3 Climate

The average annual rainfall within the catchment is approximately 760 mm (SCRN, 1999). The average annual rainfall ranges from 575 mm around the low coastal areas to 850 mm in the highlands to the south-east of Myponga River catchment (Figure 2.4). During the period from 1914 to 1994 the wettest year was 1974 with an annual rainfall of 1075 mm. The driest year recorded (364 mm) occurred in 1914 (DPI, 1996). In terms of seasonal patterns the rainfall is winter dominant (Figure 2.5). Frost incidence is also highest during the winter period. The low-lying areas of the Myponga River catchment receives frosts from April to November with up to ten frosts per month occurring during winter. The mean evaporation for the town of Myponga is approximately 1445 mm, and the mean windspeed is approximately 7 km per hr (Southern Hills Soil Conservation Board, 1995).

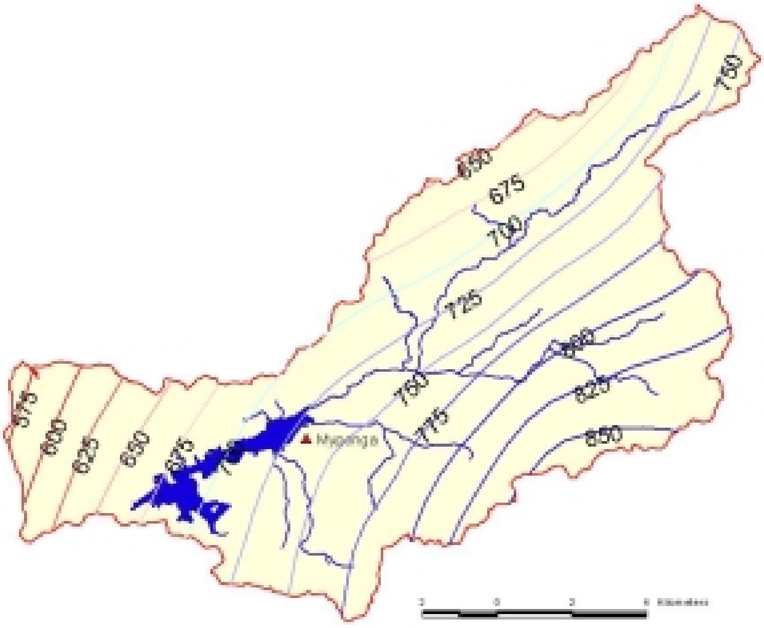


Figure 2.4 Rainfall distribution of the Myponga River catchment (mm) (source: SCRN, 1999)

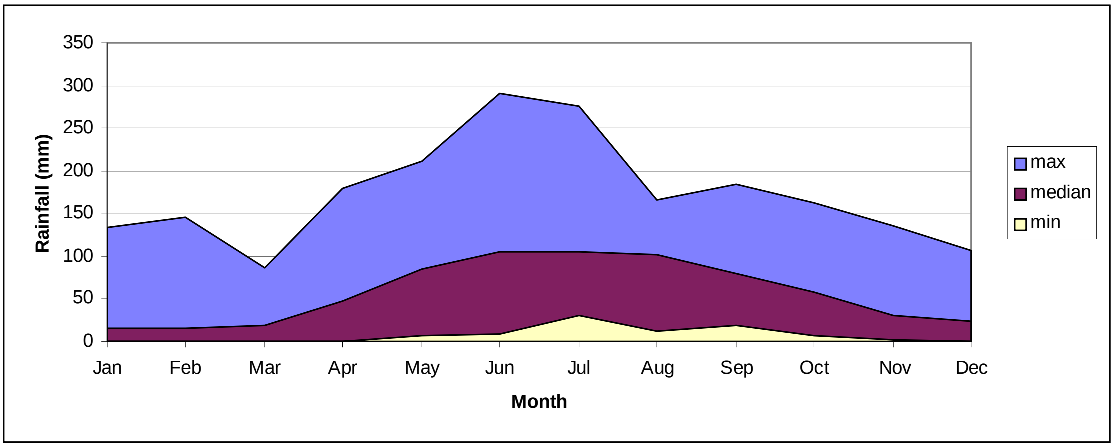


Figure 2.5 Median rainfall as recorded at the Myponga Post Office (1914-1994) (source: DPI, 1996)

2.2.4 Geology

The Myponga River catchment is part of the geological system know as the Adelaide Geosyncline. The catchment consists of a broad, flat, glacial valley infilled with Permian sand and Tertiary limestone sediments. It is bound by hills formed from hard rock processes (Adelaidian fractured rocks) to the west and Barossa Complex gneisses and schists to the east and south. The Barossa Complex (1600 million years old) is the metamorphic basement of the Adelaide Geosyncline (1000 million years ago). Quaternary clays and alluvium confine the Tertiary limestone aquifer that overlays Permian glacial sediment. This is the main aquifer utilised for the irrigation of dairy pasture in the Myponga River catchment. Sedimentary aquifers occur in limestone that overlays Permian glacial sediments in the Myponga Basin (SCRN, 1999).

2.2.5 Soils

Three main soil types have been identified from the wide variation of soils that exist in the catchment due to the geological formations; for all three soil types, the predominant landuse is grazing. They are as follows:

- associated with old glacial valleys (40%); these soils are deep but are imperfectly drained, infertile, and prone to acidification and erosion by both water and wind; include sand to loam over clays, grey and black clays, deep sands and grey clay loams

- associated with old Tertiary Plateaux and deposits of the area (15%); these soils are moderately fertile but are prone to waterlogging and are highly erodible and subject to landslip; include sandy loams to clay loams, often with ironstone gravel over yellow and red clays, grey clay loams, peaty swamps and shallow stony sands to loam

- formed over various hard rock formations or as alluvial products (15%); these soils occur on lower lying land; they are poorly drained and moderately fertile; include sand to clay loam, some with ironstone gravels over clay, shallow stony skeletal soils, grey clays and variable alluvial soils (SCRN, 1999; Southern Hills Soil Conservation Board, 1995)

The remaining 30% of the soils are too variable to broadly classify.

2.2.6 Riparian flora and fauna

The pre-settlement watercourses of the Myponga River supported a diverse range of vegetation. The dominant tree species included river red gum (*Eucalyptus camaldulensis*), pink gum (*E. fasciculosa*), blue gum (*E. leucoxylon* ssp. *leucoxylon*), swamp gum (*E. ovata*), stringybark (E. *obliqua/E. baxteri/ E. cosmophylla*), candlebark gum (*E. rubida*) and rough-barked manna gum (*E. viminalis* spp. *cygnetensis*) (Davies, 1982).

The dense understorey of the open scrub comprised numerous shrubs, ground covers and sedges. These included hakea *(Hakea ulcina and H. rostrata)*, tea-tree (*Leptospermum* spp), banksias (*Banksia marginata* and B. *ornata*), yaccas (*Xanthorrhoea tateana and X. semiplana),* wattles (*Acacia pycnantha* and *A. paradoxa*) (Williams and Goodwins, 1987). The open forest understorey was more open with many of the same shrubs and ground covers but with *Acacia myrtifolia* prominent.

Many of the watercourses in the catchment would have been marshy wetlands with no defined channel. The gullies and creeklines that support permanently waterlogged swamps remain green all year round. They are dominated by dense stands of tea-tree (*Leptospermum* spp.), reeds (*Phragmites australis* and *Typha domingensis*) and sedges (*Carex* spp). The swamps usually occur on boggy or peaty ground in low-lying areas, along creeklines or 'perched' at the tops of gullies and fed by underground springs (Littlely, 1998). Burning, slashing, draining, heavy grazing and weed invasion have all contributed to the reduction and fragmentation of swamp habitat in the region.

In the Myponga area today, only small patches of remnant native vegetation remain in the south-east and northern regions and the Yulte Conservation Park in the south-central region of the catchment.

Blackberry and willow are the two most common introduced weeds in the Myponga River catchment and have exploited the favourable growing environment of the watercourses. They are now significant weed species in some areas. Watercourses act as a conduit for the spread of weeds throughout the catchment.

The *Animal & Plant Control (Agricultural Protection and Other Purposes) Act 1986 (SA)* requires the landholders to control proclaimed plants on their property. In the Myponga area there are many proclaimed plants (Appendix C); the most dominant species that were found in this riparian survey include:

- blackberry (*Rubus fruticosus* spp. *agg.*),
- Montpellier/Cape broom (*Genista monspessulana*),
- dog rose (*Rosa canina*)/ sweet briar (*Rosa rubiginosa*).

The transformation of the riparian vegetation from native species to cleared landscape to exotic species occurred quite quickly once the area was settled. This change was encouraged by government policy of the day. Not only has this transformation had a major impact upon the aquatic and terrestrial riparian ecosystems, it has also been instrumental in shaping the attitudes of landholders and tourists as to just how watercourses should look. Generations of landholders have grown up and worked the land knowing nothing other than the bare banks or exotic species along their watercourses.

Generally the riparian zone is the most biologically diverse part of the catchment. For example, a biological survey of swamps of the Fleurieu Peninsula (Littlely, 1998) found the bush rat (*Rattus fuscipes*), swamp rat (*Rattus lutreolus*) and the yellow-footed *Antechinus* (*Antechinus flavipes*). The swamp rat is uncommon in the Southern Lofty Region as are southern brown bandicoots, which were not recorded during the biological survey. The biological survey found numerous reptiles, including a variety of skink and snakes. The bird species that were found in this survey are too numerous to mention but included the rare Mount Lofty Ranges southern emu wren and the yellow-tailed black cockatoo (Littlely, 1998).

A number of wetlands and swamps still exist in the catchment. Most lie on the smaller streams and were not surveyed. With respect to both plants and animals, they have an extremely high conservation value and most are in critical need of further conservation. Some swamps in the catchment provide habitat for the Mount Lofty ranges southern emu-wren (*Stipiturrus malachurus intermedius*), which is currently classified as critically endangered. The total population for the whole of the Fleurieu Peninsula is currently estimated at only 250 adult birds (Squires, pers. comm.). Surviving in only isolated pockets of swamps, this bird species is considered to be close to extinction.

2.3 Human development and landuse change

The dynamic nature of watercourses over time provides valuable insight into their likely future behaviour. The Myponga River catchment is now a human-dominated landscape that is largely used for grazing compared to its being once an open forest or swampland prior to European settlement. This section aims to examine briefly the patterns of landuse in the catchment and how land management practices and human enterprises have affected the watercourses of the catchment over the past 160 years. This history of the Myponga River catchment was compiled from the various literature sources cited in the text and interviews with long time residents of the area.

2.3.1 Aboriginal people and the Myponga River catchment

The original inhabitants of this area are said to be the clans of the Kaurna people, whose territory extended from Cape Jervois in the southern Fleurieu to near Crystal Brook in the State's mid-north region. The Aborigines from Encounter Bay were reported to journey through Wattle Flat to the Myponga area when there was most likely a plentiful supply of yabbies in the fresh waters of the creeks (Williams, 1991). Possums that live in the hollows of gum trees were another source of food. The women gathered roots, herbs and fruit and caught small animals, grubs, lizards and snakes for food. Nets for fishing, baskets for carrying and mats to cover themselves were made from a watercourse reed, which was most likely to be bulrush (*Typha spp.*).

2.3.2 European settlement and vegetation clearance

The first recording of Myponga appears in a dispatch forwarded to the South Australian Commissioners in London in March of 1838. This states:

> "When we came to the foot of the hills terminating the Mt Lofty Ranges to the coast we had difficulty getting the cart over the ranges - we descended into Myponga Plains which are a mile in breadth, consisting of rich land watered by a stream which appears to wind its way through a ravine between Deception Bay and Yankalilla. The Myponga Valley abounded with magnificent trees a hundred or more feet high, kangaroos, black cockatoos and masses of wild flowers of wattles, honeysuckles, Tea tree etc." (Whitford, 1974)

Settlement of the rich valley of Myponga extended naturally from the coast to the inland. The land was surveyed and land was allotted for Myponga township in 1841. Land-holdings were taken up in Myponga from 1843. The heavy stands of red and blue gums that covered much of the area were a valuable asset to the early settlers for the building of homes, sheds, fences and bridges. Stringy barks were harvested in the early part of the century to shore up mines (Plate 2.1). The cottages of these early pioneers were made of wattle and daub (rammed earth) or pise and brick, and most had dirt floors. Many cottages were built on the banks of creeks for easy access to water (Whitford, 1974). Today, little of the original riparian vegetation remains and regeneration is suppressed by grazing from livestock and continual burning.

The native vegetation of the Myponga River catchment has been extensively cleared (approximately 90 per cent) and, as a result, only fragmented patches remain. Many stands of vegetation have been subject to grazing pressure as those areas of vegetation not cleared were generally not fenced. In some parts of the catchment, grazing has been in excess of land capability. Native grasses are not well adapted to grazing and trampling by sheep and cattle. Due to the grazing pressure, many of the more palatable understorey plant species have become scarce in remnant patches of vegetation.

To the European settler, Australia was a wilderness, an unfamiliar and untamed land. In settling this land the settlers tried to recreate England by bringing its hedges, fruit trees and expanses of fields and crops to this wild land. Isolated patches of English trees were a common site throughout the Myponga River catchment (Williams, 1986). This vision of an English landscape was not suited to the Australian climate and landscape. This created landscape has considerably altered the natural diversity of the Myponga River catchment.

Woody weeds and exotic trees became established in the catchment soon after settlement, often from deliberate introduction. For example, the South Australian Company recommended the planting of gorse or furze (*Ulex europeaus*) hedges to reinforce early post and rail fences. Gorse hedges were also used for horse jumping.

Plate 2.1 Stringy barks being harvested at Hindmarsh Tiers to be used to shore up BHP mines c1917 (newspaper clipping provided by Shirley Cushion, original source unknown)

2.3.3 Agricultural development

The early settlers struggled to make a living by stripping wattle bark and keeping cows, pigs and chickens. They often had small vegetable gardens to supply their needs; some even grew tobacco. The dairy industry was established in the surrounding countryside of the Myponga River catchment soon after settlement.

The wattle barking industry was established in the late 1880s and flourished in the region for many years. The golden wattle *(Acacia pycnantha)*, which formed the basis of this industry, was common in the region. Land was cleared for the harvesting and propagation of wattle. The golden wattle was fast growing and in demand for its high tannin yield; it was used for the tanning of skins and hides for leather. Wattle bark continued to be a major source of income until the late 1920s, then gradually declined over the next 15 years. The introduction of improved pastures and competition from South African bark brought a change in landuse and gradually the wattle-covered areas became pastures (Williams, 1986). The industry declined in the early 1920s when dairying increased in popularity.

Soils in the area, like much of South Australia, are inherently infertile in their natural state. The first few years of cropping on the virgin soils had produced good yields. However, soil problems were recognised as yields declined. By the 1870s, declining yields would not support many farms (Williams, 1986). This resulted in the historical use of artificial and organic fertilisers to combat soil nutrient deficiencies.

The clearing of native vegetation for cropping, dairying, industry and township development increased surface run-off. The frequent cultivation, poor irrigation practices and fertiliser use of the market gardeners and potato growers contributed to declining water quality.

Dairying was a prominent early industry that has survived in the area. Several dairy factories were established with one of the more significant ones being The Lovely Valley Factory, built by Southern Cooperative Produce Pty Ltd in 1892. The waters of the Myponga Reservoir now cover the site. In 1937, the dairy industry prospects in the Myponga district improved with the formation of a cooperative. The cooperative's role was to market milk on behalf of the local producers. Since the 1970s milk has been stored on farms in bulk milk vats for daily collection by the factory.

The township today serves as a centre for the scattered dairying community and is located in the same valley as the Myponga Reservoir. Irrigating summer grown pasture for dairy cows is a common practice in the area. Potato growing is also established in the region. The most dominant current landuses are grazing (62%) and dairying (24%). Other landuses include plantation forests, native vegetation, vegetables/grazing rotation, rural living, vines and orchards (SCRN, 1999).

2.4 Water resources

The natural hydrological regime of the Myponga River and its tributaries has changed drastically over the last 160 years. Water storage in dams and the use of groundwater resources have reduced summer base flows. The water quality monitoring program undertaken by the EPA indicates that the Myponga River generally has moderate water quality (EPA, 1999). Land clearance and other land management practices have increased surface run-off and the peak flow rates of streams. The Myponga River catchment is used for grazing, dairying, market gardening, forestry and urban development as well as water harvesting and, as a consequence of all industrial activities, the quality of its watercourses has declined. By comparison, the water supply catchments of Melbourne and Sydney are fully protected and designated Water Supply Special Areas with no development being permitted (known as closed catchment policies).

2.4.1 Water quantity

The opportunities of the Myponga district improved when irrigation from the underground basin was developed. Bores came into use in the mid-1950s and sprinkler irrigation soon followed. In the 1960s, irrigating summer grown pastures on the land above the underground basins of Myponga and Hindmarsh Valley increased dairy production dramatically. Water was also pumped from the creek for channel irrigation of vegetables (Williams, 1986). Today, irrigation is mainly used to supply fresh feed for dairy cattle during the summer months. Groundwater monitoring wells have been established in the Mt Lofty Ranges in the past five years and there are some indications that groundwater in the small sedimentary Hindmarsh Tiers basin may be approaching its sustainable limit (EPA, 1998). Approximately 25% of the catchment is irrigated and the majority of that amount (95%) supports dairying (SCRN, 1999).

2.4.2 The Myponga Reservoir

The Myponga Reservoir is located in the south-western corner of the catchment. There are no intercatchment transfers to the Myponga Reservoir and it is entirely catchment fed. This reservoir is a vital water storage that supplies filtered water to southern metropolitan Adelaide and the southern coast area. As a water supply reservoir, SA Water (formerly E&WS) is responsible for the management of this resource.

In 1945, water demand warranted another major storage and plans were prepared to utilise the Myponga River catchment. Construction of the Myponga Reservoir began in 1957 and was completed in 1962. The Myponga Reservoir is entirely catchment fed and, subsequently, the raw water is characteristic of the catchment attributes.

The reservoir has an average yield of 15 000 megalitres per year (5 per cent of the City of Adelaide's water supply). When the reservoir is full, the water spread covers 280 hectares with a full storage capacity of 26 800 megalitres (E&WS, 1992). Various water quality management techniques, such as variable off-takes, copper sulphate and aeration, have been utilised throughout the reservoir's existence in an attempt to manage or combat the water quality problems. The water quality issues of the reservoir include algal blooms, bacterial contamination, eutrophication and stratification (Smalley, 1998). Algal blooms are strongly affected by catchment characteristics. Good catchment management to ensure maintenance of good water quality for human consumption is particularly important in this catchment.

2.4.3 Water quality

The decline in the water quality of watercourses in the Myponga River catchment is undoubtedly linked to the extent and intensity of agriculture in the area. This has led to an increase in diffuse pollution (ie pollution which arises from a large area without identifiable entry points to the watercourse). It is common practice for dairy operators to either pump all dairy effluent to tanks that are then removed by sewage tankers on a regular basis or to anaerobic ponds. A more diffuse source of water quality problems is paddock run-off, which transports a high degree of animal faeces into the watercourses. Pollutant concentrations within the catchment would relate to the predominant landuse.

Water quality testing carried out by SA Water in early 1999 detected bacterial contamination of the drinking and surface water in the Myponga Reservoir. The detection of *Cryptospyridium* cysts[1] in 1998, which are carried by cattle would indicate that grazing pressure of the riparian zone is too high. The riparian survey was able to identify where stock had riparian access and propose management recommendations (Chapter 5) to minimise stock impact.

Run-off from agricultural activities can contribute nutrients, microorganisms, pesticide, herbicide and fungicide residues and other pollutants, directly or indirectly, to watercourses. Run-off can pollute the watercourse in the following ways:

- soil loss from cultivated areas or pastures

- fertilisers transported in run-off water (primarily phosphorus and nitrogen-based fertilisers)

- animal wastes excreted directly into the watercourse stimulate algal growth, which, if excessive, encourages algal blooms

- run-off from dairies, stockyards, etc

- nitrates in groundwater seepage to watercourse

1 Cryptospyridium oocysts are of concern as they are resistant to disinfection. The thick walled oocysts are shed in faeces. Any faeces that run off into the creek will eventually get into the reservoir. Human infection can lead to diarrhoea or illness for several weeks. The levels that were found in the Myponga Reservoir were never high enough to cause a health concern.

- irrigation drainage waters (Thomas and Bennett, 1987; Box, 1993).

The Myponga River system has concentrations of copper and aluminium that are slightly above background levels elsewhere in the State and, as can be seen in Table 2.1, these concentrations exceed the ANZECC guidelines. The concentrations of copper and aluminium in water are generally higher in areas of acidic soil and high dissolved organic matter. Copper in particular has a high affinity to dissolved organic matter.

Table 2.1 Water quality indicators (mean values June 1995 to January 1997)

	Myponga River	ANZECC guidelines
Salinity (TDS)	345 µS/cm	<500 µS/cm
Turbidity (NTU)	9.9 NTU	<5.0 NTU
Nitrogen (TKN)	0.565 mg/L	<1.0 mg/L
Phosphorous, total	0.057 mg/L	<0.1 mg/L
Total organic carbon	6.42 mg/L	<10 mg/L
Dissolved oxygen	8.3 mg/L	≥6 mg/L
Total copper	0.011 mg/L	0.005 mg/L
Dissolved aluminium	0.131 mg/L	0.1 mg/L (if pH > 6.5)

Adapted from (EPA, 1998)