Alison Teese

DRAFT

Environmental Implementation Plan Loddon Catchment

LONG SWAMP

Department of Conservation and Natural Resources

B. Hurse

DRAFT

ENVIRONMENTAL IMPLEMENTATION PLAN

LODDON CATCHMENT.

LONG SWAMP

October 1994

Ron DAVIES
Catchment Environmental Officer
Department of Conservation and Natural Resources

BENDIGO.

TABLE OF CONTENTS

PURPOSE. 1

DESCRIPTION. 1

MAP 1. 2

BACKGROUND. 3

PHOTOGRAPHS. 4-5

THREATS.

- Drainage 6
- Agriculture 6
- Groundwater 7
- Salinity 8
- Introduced Species 8
- Nutrients/Toxins 9
- Native Vegetation Depletion 10
- Possible Decline in Community Commitment 10

RECOMMENDATIONS.

- Short Term 11
- Long term 12

APPENDIX 1. Long Swamp Vegetation 13

REFERENCES. 14

PURPOSE.

The intention of this report is to provide technical and background information regarding the management of Long Swamp for the Loddon Dryland Community Implementation Group and the Moolort Landcare Group. The recommendations in this report will provide the management prescriptions that will allow the pursuit of the goal set in the Loddon Catchment Salinity Management Plan;

- ***To reduce the impacts of salinity on the Loddon catchment environment, primarily through the optimum use of rain, where it falls.***

In order to achieve this goal a number of specific objectives have been developed which are achievable and critical to the future management of land and water resources in the Loddon catchment. Two of these objectives outlined in the Loddon Catchment Salinity Management Plan are;

- ***Encourage the protection and restoration of ecosystems in wetlands and streams.***

- ***Support a community based group approach to the implementation of salinity control projects and better land use practices.***

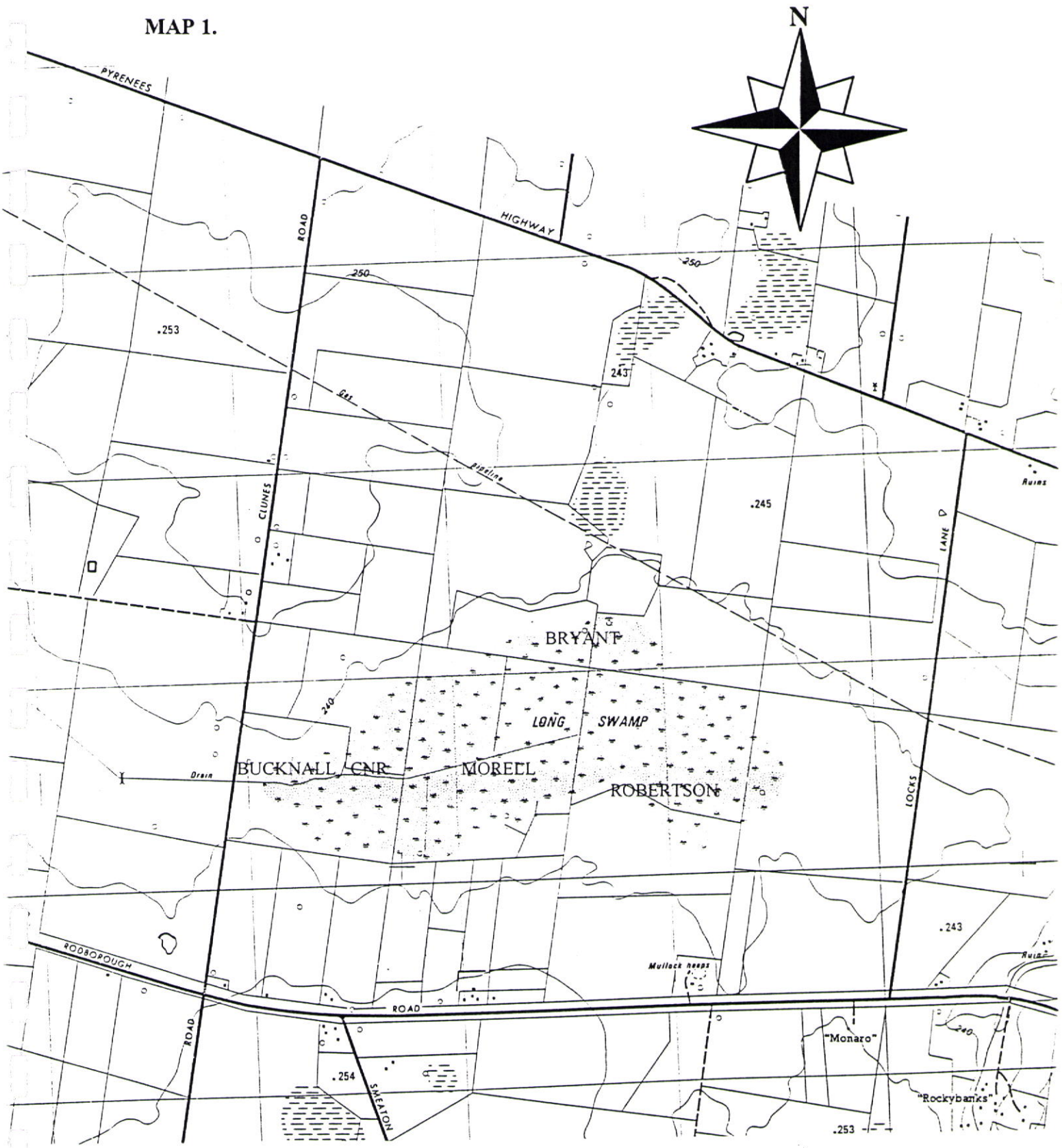
DESCRIPTION.

Long Swamp is located 2km east of the northern end of the Tullaroop Reservoir on the volcanic plains. A freshwater meadow, this swamp occupies approximately 177 ha. The swamp at present is on freehold land, four landholders are involved (Map 1).

Although the area is highly salt affected from saline discharge, the swamp retains some unique values. When the area contains water, bird life is prolific with a large number of species present, in particular, brolgas have been recorded. The swamps overall size adds to the site's value, and its location adds an important link in the chain of wetlands that stretch from Clunes in the south to the Murray River.

Large Red Gums, many that are dead (see Photo 1), dominate the remaining native vegetation and areas of Cane Grass with Tangled Lignum, Wallaby Grass and Spear Grass are present. The occurrence of the introduced noxious weed Spiny Rush (see Photo 2) appears to be increasing. Bare soil, salt stains, salt crystals (see Photo 3) and salt tolerant plants are widespread on the lower areas of the swamp. These problems are directly linked with the rising ground water and high levels of salinity.

MAP 1.



SCALE 1:25000

BACKGROUND.

Prior to being drained in 1965 it was reported that Long Swamp held 60-90cm depth of water during winter months, and that during the summer months when the swamp was nearly dried up, there were problems with soil erosion by wind. These bare areas, thought to have been caused by salt, could well have been caused as well or instead by inundation and overgrazing. (CNR file 06/93/294).

Groundwater flow within the Long Swamp region appears to be influenced by the original shape of the landscape over which basalt flowed and the presence and extent of weathered zones at depth within the basalt. Investigations of groundwater flow suggests that salinity in Long Swamp is caused by recharge occurring within the catchment to the north (CNR 1993).

To reduce the effects of salinity on native vegetation and to bring more land into agricultural production the council of the Shire of Tullaroop in 1961 proposed to drain the Long Swamp. This was strongly opposed by the Maryborough Field Naturalists. In an open letter to the Maryborough Advertiser, they claimed that the swamp,

> .....with its ample food supplies and cover, supports a large wildfowl population and that conservation will never be assisted by the destruction of the natural breeding and feeding grounds of these birds.

It was further stated that,

> .....as conservationists we view the present drainage proposal with great concern, and as taxpayers we question the justice of government funds being made available for the benefit of individual private landholders.

Recent community concern over the salinity problems of Long Swamp has led to members of the Moolort Landcare Group to undertake salinity control measures such as; the introduction of perennial pastures (including aerial seeding) to the upper slopes to the north to control recharge. A tree re-establishment program has also commenced, particularly on areas not suitable for pasture.

PHOTOGRAPHS.

Photo 1. Dead Red Gums and salt affected Red Gums at the high water mark.

Photo 2. Spiny Rush invading the Cane Grass areas.

PHOTOGRAPHS.

Photo 3. Dead vegetation encrusted with salt crystals.

Photo 4. Salt crystals on large areas of bare soil.

THREATS.

In Victoria, the shallow freshwater meadows, marshes, and herb and rush dominated swamps have been the most affected by European settlement. These wetland types were the easiest to drain for agriculture because of their temporary and shallow nature.

On the positive side, a major feature of swamps is their resilience to change because of the ability of aquatic plants and animal species to adapt to varying conditions. Swamps usually rehabilitate naturally if the degrading or threatening processes are stopped or reversed.

- **Drainage**

Drainage of wetlands to create productive agricultural land has played a major historical role in loss of or damage to the conservation values of many Victorian wetlands. Today, it is still one of the main reasons for the profound change in wetland environments.

Extensive drainage schemes have, in the past, been undertaken with Government financial assistance and advice, in the belief that wetlands were wastelands being converted to productive agricultural use.

A major threat to Long Swamp may be the continual drainage of the swamp via a drain cut from the lowest point through a ridge line, into a depression which leads the water into the Tullaroop Creek below the Tullaroop Dam to the west.

In 1988, community concern regarding the future of Long Swamp was raised as an issue to the Department of Conservation and Natural Resources (CNR) and as a result the purchase of land at the downstream end of the swamp was given high priority. An appeal for funds for the purchase of approximately 40 ha a portion of Long Swamp owned by K. and D. Bucknall was commenced by the Victorian Conservation Trust and a target of $32000 was reached. Control of this land is now with CNR.

There had been a suggestion that low level banks could be constructed on the area after it was purchased, to create a shallow freshwater marsh, but this should only occur if and when other landholders had been consulted, and were satisfied there would be only minimal adverse effect on their land.

- **Agriculture.**

The relationship between grazing and protection of wetland values is complex. On the negative side, careless stock management can have long-term effects which can upset the existing ecological balance and threaten floral and faunal habitats and their associated conservation values. Grazing animals can selectively remove young plants, palatable species, reduce seed-set by eating flowers and destroy cover used by native animals. The removal of protective vegetation leads to destabilisation of the soils. Stock may compact the soil and/or break up the soil and can muddy and foul water in a wetland. This may reduce light penetration, deplete oxygen levels and increase

nutrient concentrations. These changes will adversely affect the native vegetation and the habitat of many plant and animal species.

On the positive side, light grazing for limited periods may increase protection against fires, reduce dominance of introduced perennial plants, and may be preferable to the use of herbicides for the control of weeds. However, the further spread of introduced plants needs to be considered.

The impact of grazing will vary according to the timing (season and duration) and the type of stock. Cattle readily enter water to graze emergent plants; however sheep are less likely to enter water, cannot graze in deep water and are less likely to be grazed on wet sites due to the dangers of contracting footrot or liver fluke.

Grazing should be managed to minimise damage by restricting access to the swamp using standard cattle and sheep fencing as this will not prevent access by kangaroos. Alternatively, if cessation of grazing is not possible in all areas, restrict the duration, timing and stock numbers to a level where the wetland values are maintained and damage is minimised. The period when soils are dry, seeds have fallen and breeding is complete may be suitable for grazing.

The exact number of stock that can be grazed and the impact they will have on the swamp will be dependant on seasonal conditions and can only be determined by experiment and observation. It would be better to underestimate the stocking rate than to overestimate. Pigs and goats are destructive feeders and should not be permitted access to Long Swamp.

Many wildlife species, such as goannas and echidnas, require dead trees with hollows, fallen logs and litter (bark, twigs and leaves) as part of their habitat. Past agricultural practices have not allowed a build up of this material to occur. Future firewood collection and "tidying" up the area should be restricted if these habitats are to return.

- **Groundwater**

A drilling program was initiated in 1993 by CNR and the Loddon Dryland Community Working Group to investigate groundwater flows and salinity processes at Long Swamp. Investigations revealed that the basalt layer has undergone varying degrees of weathering. Weathering is particularly severe between the successive basalt flows ie. weathering and soil development have taken place after the first basalt flow and has subsequently been covered by a later basalt flow.

The zones between the successive basalt flows are generally preferential groundwater flow paths and yield large quantities of groundwater. Water levels in observation bores indicate that the groundwater surface slopes gradually from north to south towards the swamp, indicating that groundwater flow is also from north to south. The observation that salinity is creeping upslope to the north confirms that the catchment area to the north of Long Swamp acts as a recharge area for discharge in the swamp.

Groundwater salinities sampled from bores drilled in the basalt were unusually high for basalt rock in the area. A possible explanation for this is that the weathering zones contain high salt stores which influence groundwater quality (CNR 1993).

Investigations involving the underlying sediments of the buried ancient landscape and bore water levels suggest that the upward sloping bedrock surface on the western side of the swamp is likely to provide a barrier to groundwater flow which is transmitted via zones between successive basalt flows into the swamp from the north east. This maintains high groundwater levels in the base of the swamp. It is likely that as groundwater pressures have continued to rise since clearing across the plains, the groundwater system is full and continued recharge has caused further spread of salinity on the north-eastern side of Long Swamp.

- **Salinity**

In wetlands, the plants (riparian vegetation, macrophytes, micoalgae) and macroinvertebrates (and possibly microfauna) will be the biota most sensitive to increases in salinity. The available scientific literature suggests that direct adverse influence will occur in freshwater wetlands when the salinity is increased to approximately 1500 EC. More subtle sub-lethal effects are likely to occur at salinity levels below this, however the scientific data are not available to assess the extent that this might occur (Salinity Bureau 1989).

Salinity readings of 32000 EC. have recently been recorded and large areas of the swamp has salt crystals present (see Photo 4). It is expected that the first substantial rain will dissolve these salt crystals and significantly raise the salinity level beyond 32000 EC and become diluted with further rains. Over the summer period, evaporation will cause the salinity levels to rise again. This cyclic event may have the long term effect of increasing salinity levels within Long Swamp.

The extent and magnitude of the dryland salinity problem at Long Swamp is more serious when considering that in years of high rainfall, much of the salt load may end up in the Murray River via the Tullaroop and Loddon Rivers.

- **Introduced Species**

The most prolific introduced species in Long Swamp is Spiny Rush. The south-eastern section of the swamp has become heavily infested with Spiny Rush. Water is the most important dispersing agent, transporting either the small seeds or the capsules and consequently the potential area of infestation could be the entire swamp and downstream.

Once firmly established Spiny Rush will completely cover an area and will eliminate almost all other vegetation. The swamp will then become impenetrable to humans and most animals because of the very sharp spines. It also provides effective harbour for rabbits and foxes.

Effective control of Spiny Rush at Long Swamp will involve the co-operation of the four landholders. The use of herbicides has in the past given uncertain results. Recently developed herbicides such as hexazinone and glyphosate are more reliable, however, chemical control in dense patches may be difficult. Follow the manufacturer's instructions carefully to avoid contamination of the wetland area. Consequently, mechanical removal of the existing heavy growth, may be a practical starting point of a joint control program to be followed up with chemical control. A specialised 3-point linkage unit for tractors called a "Yacca Cutter", is available from CNR for mechanical removal of Spiny Rush.

The high numbers of rabbits present, particularly on the south east section of the swamp are of concern. These rabbits have ample cover in the Spiny Rush and the basalt rises and would have contributed to the depletion of native vegetation. Control of the rabbit population will be necessary for the successful management of the swamp to be pursued.

Effective control of rabbits at Long Swamp will involve the co-operation of the four landholders in a series of 1080 poison campaigns with continued monitoring and appropriate follow up work if required. The removal of Spiny Rush will play a significant part in controlling the rabbits by reducing the available habitat.

Foxes and cats are known to frequent the Long Swamp area, the identification of foot prints and scats indicate high numbers. Predation by introduced predators such as foxes are a major threat to wildlife, particularly young Brolgas. Although, foxes and cats also prey on rabbits, an eradication program using "Foxoff" needs to be implemented by all landholders. An effective control program will encourage the return of native animals to the area.

- **Nutrients/Toxins**

Changes in the levels of nutrients can have a major impact on the plant community and significant increases can eliminate plants that are adapted to low levels of nutrients or that are shaded by the increased phytoplankton growth. Excessive plant growth leads to lower water movement and reduced dissolved oxygen which is required for aquatic life. Nutrient changes may favour introduced plant species which can displace native species and so change the nature of the vegetation community.

Agricultural chemicals may be harmful to aquatic life, therefore, landholders need to follow the manufacturer's instructions carefully, or seek environmentally safer alternatives.

Sources of nutrients include fertilizers, manure, sediments, carcasses, rotting weed growth and rubbish dumps. Nutrient levels may change naturally, for example, as a result of colonisation by a flock of birds.

There is a need to carefully consider fertilizer input to pastures and create a buffer zone of dense low plant cover of native reeds, sedges and grasses surrounding the swamp to capture nutrients. Grazing needs to be restricted within the swamp and the

natural recycling of stock faeces on pasture must be undertaken. The use of toxic chemicals must be avoided wherever possible. If attention is payed to the input of nutrients conditions favourable to blue-green algae will be avoided.

- **Native Vegetation Depletion**

The most common cause of loss of a range of native plant species is due to grazing by agricultural animals and introduced pests such as rabbits. The Long Swamp area has been grazed for over a century and as a result many native species have been removed by preferential grazing and have been replaced by introduced pasture species and weeds. Natural regeneration is difficult while grazing persists, as any native tree seedling is quickly removed by stock or rabbits.

As previously discussed, stock grazing and rabbits need to be controlled on the swamp to promote native plant regeneration.

Salinization of the swamp has occurred due to changes in catchment hydrology. Changing salinity levels have had a dramatic effect on plant and animal life with salt-intolerant species disappearing and being replaced by salt-tolerant species, many that are introduced. The number of introduced plants represents almost 70% of the total plant species present (see Appendix 1) and the number of salt tolerant plants represents over 65% of the total species present. The salt tolerant plant species are abundant in the lower lying, higher saline areas.

A revegetation program for Long Swamp must consider the level of salt tolerance of the species to be planted to secure the longevity of each plant.

- **Possible Decline in Community Commitment**

The long term success of reducing the impact of salinity on Long Swamp is dependant on the continued enthusiasm of members of the local community and community groups.

The majority of the work necessary for reducing the level of groundwater involves work in the recharge area to the north of Long Swamp and the support and commitment of these landholders is vital.

The involvement of the Moolort Landcare Group, the technical and possible financial assistance from CNR and the drive of the Loddon Dryland Community Implementation Group needs to ensure the long term involvement of all necessary members of the community.

RECOMMENDATIONS

- **Short Term**

- Consultation with all adjacent landholders to set a time frame for implementation of management options.

- A fox control program using "Foxoff" needs to be implemented by all landholders.

- Implement an effective rabbit control involving the co-operation of the four landholders in a series of 1080 poison campaigns with continued monitoring and appropriate follow up work if required.

- Undertake an effective control program for Spiny Rush involving the co-operation of the four landholders. Mechanical removal of the existing heavy growth, is a practical starting point to be followed up with chemical control. A specialised 3-point linkage unit for tractors called a "Yacca Cutter", is available from CNR for mechanical removal of Spiny Rush.

- Fence Long Swamp above the high water mark allowing at least a 20m buffer and review grazing.

- Revegetate the area below the high water mark with Tangled Lignum and Cane Grass.

- Create a 20m buffer zone of dense low plant cover of native reeds, sedges and grasses surrounding the swamp to capture nutrient runoff from pastures.

- Grazing needs to be restricted within the swamp and the natural recycling of stock faeces on pasture using harrows needs to be considered.

- The use of toxic chemicals must be avoided wherever possible.

- Carefully consider fertilizer input to pastures so conditions favourable to blue-green algae may be avoided (CNR pamphlet).

- Revegetate the area above high water mark with native species (including Red Gums, Tangled Lignum and Wallaby and Spear grass).

- Continue to establish perennial vegetation in the recharge area, (including cultivars of lucerne or phalaris/cocksfoot mixtures and tree planting) through the Land Protection Incentive Scheme (LPIS).

- Investigate the effects of standing water, groundwater pressure and the effects on the surrounding land.

- Consultation by Land For Wildlife Officer CNR with all adjacent landholders.

- **Long Term**

- Encourage lasting community involvement and commitment through the Moolort Landcare Group for the management of Long Swamp and the recharge areas.

- The closure or control of the drain through the middle of the swamp once salinity levels are reduced.

- Construction of low level banks to recreate the shallow freshwater meadow on the western area to be managed by CNR and the Moolort Landcare Group.

- Continued monitoring of observation bores by the Moolort Landcare Group with support by CNR to measure impact of management.

- Vermin Proof fencing.

APPENDIX 1. Long Swamp Vegetation.

Map Sheet	7623
East	580
North	905
Minor Grid	J09
Land Management Unit	VP
Wetland Classifiaction	FM
Vegetation Community	RG

Scientific Name	**Common Name**	
MONOCOTYLEDONS		
Cyperus eragrostis *	Umbrella Sedge	P
Eleocharis acuta	Common Spike Rush	O
IRIDACEAE		
Romulea rosea *	Onion Grass	O
JUNCACEAE		
Juncus acutus *	Spiny Rush	A
Juncus articulatus *	Jointed Rush	O
Juncus flavidus	Tussock Rush	O
Juncus holoschoenus	Jointed Leaf Rush	P
POACEAE		
Agrostis avenacea	Blown Grass	O
Agropyron elongatum *	Tall Wheat Grass	O
Avena fatua *	Wild Oats	O
Bromus hordaceous *	Soft Brome	P
Critesion marinum *	Sea Barley Grass	A
Critesion murinum *	Barley Grass	P
Cynodon dactylon *	Couch Grass	P
Danthonia sp.	Wallaby Grass	C
Eragrostis infecunda	Cane Grass	C
Lolium sp *	Rye Grass	O
Phalaris aquatica *	Phalaris	O
Polypogon monspeliensis *	Annual Beard Grass	O
Puccinellia stricta	Marshgrass	P
Stipa sp.	Speargrass	O
ASTERACEAE		
Cirsium vulgare *	Spear Thistle	O
Cotula coronopifolia *	Water Buttons	O
Hypochaeris sp *	Dandelion	O
Picris echiodes *	Ox-tongue	O
Sonchus asper *	Prickly Sow Thistle	P
Sonchus oleraceous *	Common Sow Thistle	P
Silybum merianum *	Variegated Thistle	O
Xanthium spinosum *	Bathurst Burr	P
BRASSICACEAE		
Lepidium africanum *	Peppercress	O
CAMPANULACEAE		
Pratia concolor	Poison Pratia	C
MYRTACEAE		
Eucalyptus camaldulensis	Red Gum	O
PLANTAGINACEAE		
Plantago coronopus *	Bucks Horn Plantain	C
POLYGONACEAE		
Muehlenbeckia cunninghamii	Tangled Lignum	O
Rumex crispus *	Curled Dock	O

TOTAL NATIVE	11
TOTAL EXOTIC	24
TOTAL SPECIES	35

LEGEND.

A : VISUALLY ABUNDANT
C : VISUALLY COMMON
O : OCCASIONAL
P : JUST PRESENT
VP : VOLCANIC PLAINS
RG : RED GUM
FM : FRESHWATER MEADOW
* : AFTER BOTANICAL NAME
INDICATES INTRODUCED SPECIES

REFERENCES.

Department of Conservation and Natural Resources File number 06/93/294 held at the Bendigo CNR office.

Department of Conservation and Natural Resources (1993). Salinity Investigations at Long Swamp, Moolort Plains. Centre For Land Protection Research, Technical Report No. 10.

Loddon Community Working Group (1992). Loddon River Catchment, Dryland Salinity Management Plan.

Salinity Bureau (1989). Biological Effects of Saline Discharges to Streams and Wetlands. Chisholm Institute of Technology.