

Loxton to Bookpurnong LAP

Pyap to Kingston On Murray

Land and Water Management Plan
Implementation - Vegetation Health
and Mapping

DRAFT

February 2009

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Australian
WATER
Environments



Document History and Status

Issue	Rev.	Issued To	Qty	Date	Reviewed	Approved
1	1	Jeremy Nelson	1 (Emailed .pdf)	04/02/09	MD	ST

Printed: 4/2/2009 9:37:00 AM
 Last Saved: 3/2/2009 3:32:00 PM
 File Name: E:\Projects\09027 (Pyap to Kingston LWMP Implementation)\09027a
 LWMP Projects\6 Reporting\09027a_R001 Pyap_to_Kingston V001
 081205.doc
 Project Manager: Martin Wood
 Name of Client: Loxton to Bookpurnong LAP
 Name of Project: Pyap to Kingston On Murray
 Name of Document: Land and Water Management Plan Implementation
 Job Number: 09027a

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1. Introduction

The Pyap to Kingston On Murray LWMP area encompasses both the dry land and all irrigation areas along the western side of the river from Pyap, downstream from Loxton, to a few kilometres beyond Devlins Pound, west of Kingston On Murray. The planning area is a component of the Loxton to Bookpurnong Local Action Planning Area, and the land is predominantly used for horticulture, cropping, grazing, residential/town areas, floodplain and wetland areas and remnant mallee vegetation.

The vision of the Pyap to Kingston LWMP Group is “Sustainable production, sustainable environments” and maintaining and enhancing the value of the social, economic and natural assets of the area is a key objective. As a result of consultation with the local community¹, salinity issues were shown to be the highest priority threat in the area, while preserving biodiversity and function within ecosystems also ranked as a high priority.

This document looks at the remnant vegetation of the area, its health and condition and what actions are necessary to preserve and improve its biodiversity values.

¹ Hyder Consulting Pty Ltd (2008)

2. Floristic Vegetation and Tree Health Mapping – available information

This section provides a review of available information and data pertaining to work undertaken to date on vegetation health and mapping in the Pyap to Kingston district which has been divided into two distinct areas – floodplain and highland.

The review includes:

- a description of the remnant vegetation in both highland and floodplain areas, including Pre-European mapping, DEH floristic mapping, previous floodplain vegetation health mapping, Biological Survey of SA and Heritage Agreement information;
- the findings of a field reconnaissance trip to inspect the health and condition of remnant patches of vegetation; and
- identification of the major threats to remnant vegetation.

2.1 Highland (mallee) areas

(a) The Pre-European settlement floristic native vegetation – Murray Mallee

The Pre-European settlement floristic native vegetation - Murray Mallee dataset (DEH) mapping identifies the location, floristic and general structural classification of areas of native vegetation thought to have been found within the Murray Mallee region of South Australia prior to European settlement. This information is an essential dataset to the Environmental Database of South Australia and is also significant information required for any environmental analysis aiming to determine conservation status of remnant plant communities. The mapping can be used to provide information on a regional or local scale and is available for government, non government and community groups.

This mapping indicates that the Pyap – Kingston area once supported large tracts of *E. gracilis*, *E. oleosa* Very Open Mallee over chenopod shrubs and Spear Grass. This mallee community dominated the landscape, but was interspersed by small patches of False Sandalwood (*Myoporum platycarpum*) and Native Pine (*Callitris gracilis*) Low Woodland and Bullock Bush (*Alectryon oleifolium*) Tall Shrubland.

(b) Vegetation floristic mapping

The SA Department for Environment and Heritage's Native Vegetation (Floristic) dataset represents the key existing native floristic vegetation mapping layer for South Australia. The dataset provides floristic and structural information, and/or presence of native vegetation in

SA and includes floristic vegetation mapping datasets produced as part of the Biological Survey of SA program. The database uses the National Vegetation Information System (NVIS) Framework.

According to DEH Vegetation Floristic Mapping, plant communities in mallee areas of the Pyap to Kingston district comprise small, fragmented patches of remnant mallee and open mallee woodland, Bluebush and Saltbush Shrublands and Spear Grass Tussock Grasslands (see Appendix A for details). These remnants occur on private land and along roadsides, in a landscape which is dominated by cropping and grazing land.

(c) Biological Survey of South Australia survey quadrats

Quadrat based surveys of flora and fauna are undertaken by the South Australian Department for Environment and Heritage (DEH) on a regular basis, usually as part of regional biological surveys. This data is stored in the Environmental Data Base of South Australia. From time to time biological surveys are conducted by other groups (eg the Nature Conservation Society of South Australia) and data collected can be submitted for inclusion in the Environmental Data Base of SA, along with incidental observations from trained observers (eg single species sightings rather than formal quadrat surveys).

The search tools available at the Department for Environment and Heritage website www.naturemaps.sa.gov.au were used to search for recent biological survey quadrats in the Pyap to Kingston area. Data has been collected from 15 sites across the highland area as part of a 1990 - 1991 survey. Plant communities recorded include *E. dumosa*, *E. socialis*, *E. oleosa*, *E. gracilis*, *E. incrassata* mallee over understoreys dominated by chenopod shrubs. No flora species recorded have state or regional conservation significance.

(d) Heritage Agreements

Four remnant highland areas are protected by a Heritage Agreement. These are:

- HA Number 402 - Sections 505 & 664, Hundred of Moorook. Two separate blocks which cover approximately 74 hectares and 26 hectares (a total of 100 hectares). The Heritage Agreement supports *Eucalyptus gracilis*, *E. cyanophylla* Open scrub and *E. socialis*, *E. cyanophylla* Open scrub on the sand dunes and *E. oleosa*, *E. gracilis* Open scrub and *Austrostipa* sp. grasslands in the scrub blocks. The area supports extensive stands of first-growth mallee.
- HA Number 403 - Lot 2, DP 53517, Hundred of Moorook. Approximately 295 hectares of *E. gracilis* Open scrub and *Acacia nysophylla* +/- *Senna artemisioides* ssp. +/- *Dodonaea viscosa* ssp. Tall shrubland. The area supports patches of first-growth mallee which provide hollows for roosting bats and nesting birds.
- HA Number 576 - Section 239, Hundred of Moorook. Approximately 101 hectares.
- HA Number 716 - Section 285, Hundred of Moorook. Approximately 105 hectares of *E. oleosa*, *E. gracilis* Open scrub and *E. cyanophylla*, *E. socialis* Open scrub.

2.2 Floodplain areas

(a) Vegetation floristic mapping

According to DEH Vegetation Floristic (NVIS) Mapping, plant communities present on the River Murray floodplain include a mixture of forests, woodlands, chenopod and lignum shrublands, sedgeland and grasslands (see Appendix A for details).

(b) Biological Survey of South Australia survey quadrats

A search was undertaken for recent biological survey quadrats in the Pyap to Kingston area. Data was collected from 21 sites across the floodplain as part of a 2002 – 2003 survey. Of those flora species recorded from these floodplain quadrats, the species listed below have state or regional conservation significance.

Species Name	Common Name	AUS	SA	MU
<i>Brachyscome basaltica</i> var. <i>gracilis</i>	Swamp Daisy		R	R
<i>Calotis cuneifolia</i>	Purple Burr-daisy			U
<i>Calotis scapigera</i>	Tufted Burr-daisy		R	R
<i>Cressa australis</i>	Rosinweed			U
<i>Crinum flaccidum</i>	Murray Lily			U
<i>Eclipta platyglossus</i>	Yellow Twin-heads			U
<i>Epaltes australis</i>	Spreading Nut-heads			U
<i>Eremophila divaricata</i> ssp. <i>divaricata</i>	Spreading Emubush			U
<i>Glycyrrhiza acanthocarpa</i>	Native Liquorice			U
<i>Maireana appressa</i>	Pale-leaf Bluebush			U
<i>Muehlenbeckia horrida</i> ssp. <i>horrida</i>	Spiny Lignum		R	R
<i>Myoporum parvifolium</i>	Creeping Boobiella		R	R
<i>Poa fordeana</i>	Forde's Poa			U
<i>Polygonum plebeium</i>	Small Knotweed			U
<i>Sclerolaena brachyptera</i>	Short-wing Bindyi			
<i>Sclerolaena tricuspis</i>	Three-spine Bindyi			U
<i>Senecio runcinifolius</i>	Thistle-leaf Groundsel			U

U = Uncommon

R = Rare

K = of Uncertain status

AUS = Listed under the EPBC Act 1999 (National conservation status)

SA = Listed under the NPW Act 1972 South Australian conservation status)

MU = Regional Conservation status within the Murraylands region according to RE Taplin (1998) Florlist V2.0d (using data file FLZ0406U) which follows Lang, P.J. & Kraehenbuehl, D.N. (2006).

(c) Floodplain Vegetation Health Mapping

Australian Water Environments (AWE, 2000) undertook an assessment of floodplain vegetation from Pyap to Overland Corner in 1999. The primary objectives of this study were to document the current status and the historical trends in vegetation health and community structure; identify the processes affecting vegetation health on the floodplain; estimate future trends in vegetation health resulting from current and alternative future irrigation trends and natural resource management options; and to provide a preliminary assessment of options for reducing future degradation.

Field mapping of the current status of the riparian vegetation (Black Box and River Red Gum) was conducted and then compared to historical mapping. The report concluded that there was a general decline in vegetation health in floodplain areas from 1945 to 1999 and that this trend was likely to continue due to a combination of raised river levels due to locking and raised groundwater levels associated with irrigation development. Dead vegetation was generally present at the landward edge of the floodplain adjacent the irrigation areas. Vegetation in good health was mapped mainly in areas adjacent to the main river channel. Tree regeneration was noted on several of the floodplains and appears to be related to flood cycles, de-stocking and also the decline in rabbit numbers. The longevity of regeneration where it occurs within areas of tree death is uncertain.

Tree health mapping of the entire length of River Murray Floodplain in South Australia was undertaken by DEH in 2002 (Smith & Kenny, 2005). This mapping indicates large areas of dead or unhealthy trees, particularly within the Banrock North and Banrock Floodplains, as well as adjacent to Wachtels Lagoon and throughout Pyap Lagoon and Floodplain.

(d) Wetlands

The Pyap to Kingston area includes the following wetlands:

- Banrock North Floodplain
- Banrock Floodplain
- Kingston Common Wetland and Floodplain
- Wachtels Lagoon and Moorook Floodplain
- Yatco Lagoon and Floodplain
- Pyap Lagoon and Floodplain

Generally, most wetlands and floodplains in the district have seen a significant decline in tree health and overall floodplain condition due to the lack of flooding in the past 10 years (SKM 2005). A Wetland Management Plan for the Yatco Wetlands (MainStream Environmental Consulting 2008) has identified a continuing lack of recruitment and declines in health and death of floodplain trees, continuing loss of fringing vegetation (no recruitment or regeneration occurring) and loss of species diversity as major threats.

2.3 Field reconnaissance

A two day reconnaissance of the Pyap to Kingston area was undertaken in November 2008. Remnant patches of vegetation in the highland areas were inspected on Day 1 and floodplain areas were looked at on Day 2.

Additional plant communities observed as part of the field reconnaissance include:

- A small patch of Southern Cypress Pine (*Callitris gracilis*) Low woodland in the south-east corner of the project area, approximately 6 kilometres west of Pata on the northern side of May Road. This plant community is moderately conserved in South Australia (Neagle 1995), although in the SA MDB it is considered threatened due to preferential clearance in the past which has resulted in its limited distribution.
- Scattered patches of *Eucalyptus cyanophylla* Open mallee with sparse sclerophyllous shrubs. This plant community has a restricted distribution and is a 'Priority 3'² poorly conserved community with remaining examples being largely small and degraded in South Australia.

2.4 Major Issues/Threats affecting Remnant Vegetation

The major issues which are affecting the health and condition of remnant vegetation in the Pyap to Kingston area include:

- Lack of natural regeneration due to grazing pressure from a combination of rabbits, stock and kangaroos. This seriously threatens the long-term survival of remnant blocks of vegetation.
- Increased salinity which has contributed to a continuing decline in the health of trees on the floodplain and the altered composition of understorey species (i.e. an increase in the cover and abundance of salt-loving species such as salt-bush and samphire).
- Fragmentation due to past broadscale clearance for agriculture. Most remnant blocks of scrub in the highland areas are relatively small and isolated.
- Lack of first-growth mallee with hollows which provide habitat for a range of birds and mammals.
- Insect attack (sap suckers, borers etc.) and diseases which are contributing to a general decline in the health of many eucalypts.
- Recreation activities such as camping and picnicking on the floodplain which have led to problems such as excessive tracks, erosion, litter, tree and dead wood removal for firewood, trampling of understorey plants.
- Stockpiling of rubbish in the mallee areas which has been occurring since European settlement commenced in the 1800's.
- Trail bike and other tracks along roadsides, through scrub blocks and across the floodplain which destroy and fragment native vegetation, as well as moss and lichen cover. This then leads to increased erosion.

² Neagle, N. 1995.

3. Native Vegetation Project Scope

This section details projects which could be undertaken to protect and improve the conservation values of remnant vegetation in the Pyap to Kingston district.

The overall objectives of proposed vegetation projects in the Pyap to Kingston area are to:

- identify, prioritise, manage and monitor remnant vegetation in order to protect and improve its conservation values;
- promote greater biodiversity and habitat values through revegetation and habitat restoration; and
- encourage public appreciation of native vegetation and provide opportunities for the local community to become involved in its conservation and management.

Proposed works range from updating the floodplain tree health mapping undertaken in 1999 by AWE, assessing and mapping the condition of highland vegetation, undertaking condition monitoring, undertaking strategic revegetation works, fencing programs, assessment and monitoring of grazing impacts and ongoing tree health monitoring. Costs for individual projects have been included although these are approximations only.

3.1 Update floodplain tree health mapping and assessment

Undertake an update of the mapping and assessment of the health of floodplain vegetation from Pyap to Kingston initially carried out by AWE in 1999. The aim is to gain a better picture of the trends in vegetation health and what the current and future impacts are likely to be. There is evidence to suggest that there is now less salt flux impacting on floodplain vegetation due to a combination of factors, including reduced water allocations and increased overall irrigation efficiency in recent years. It is not presently known what impact (if any) these influences are having on the vegetation.

Methodology

- Desktop review of current aerial photography, combined with the AWE floodplain tree health mapping, existing DEH floodplain and wetland vegetation mapping, previously collected Biological Survey of SA data, previous site inspections, historical information and other available data sources.
- Field reconnaissance to ground truth the mapping, with particular focus on areas where it appears that health and condition may have changed.
- Production of the GIS tree health coverages and hard copy maps.

- Comparison of past and current mapping and development of correlations between the patterns of degradation and various environmental parameters; the timing and pattern of vegetation degradation; and the timing and patterns of land management practices such as irrigation, changes to flood frequency, grazing history and floodplain irrigation.

Proposed cost = \$20,000

3.2 Comprehensive highland vegetation condition mapping and prioritisation

Much of the floristics and structure of remnant vegetation of the study area has previously been mapped. In order to inform future biodiversity projects, undertake mapping of the health and condition of remnant highland plant communities of the study area which, combined with existing vegetation mapping, will enable sites to be prioritised according to their conservation significance.

Methodology

- Desktop review of current aerial photography, combined with existing DEH floristic vegetation mapping, previously collected Biological Survey of SA data, previous site inspections, historical information and other available data sources.
- Undertake field surveys to ground truth the mapping.
- Prioritise areas of remnant vegetation for management and protection, based on criteria such as patch size, potential for long-term viability, species diversity, habitat for threatened species and connectivity. A summary table will be prepared listing each priority site, its area and its ecological attributes.
- Production of the GIS vegetation coverages and hard copy maps.

Proposed cost = \$15,000

3.3 Management action plans

Develop a vegetation management action plan for each priority area. An action plan outlines the basic procedures for on-ground work required to maintain and improve native vegetation and its habitat value. A yearly schedule of actions, listed in order of priority, should be included and reviewed each year to monitor progress. Suggested management actions may include fencing and de-stocking of remnant scrub blocks, rabbit control, weed control, formal protection under a Heritage Agreement, provision of artificial nesting hollows of different sizes, retention of dead and fallen timber and on-going monitoring.

Action plans should be developed in close consultation with the landholder or volunteer/s whose job it will be to implement the plan. This is done to ensure that actions are realistic, achievable and agreed upon.

Following is the suggested format of an action plan.

Name, Location	Name of the block, location description including bounding roads.
General Description	Overview of land form, existing vegetation and general condition, known uses by the community.
Objectives for the Block	Statement of specific objectives. For example if there are particular key species that have been recorded on site that would benefit from habitat provision.
Native species present	Reference to species lists (provided as an appendix) with species of conservation significance specifically commented on.
Current vegetation condition	Comments on the integrity and connectivity of remaining vegetation
Weed issues	Map major weed infestations
Pest animal issues	Rabbits, goats, foxes. Provide information on eradication methods
Grazing issues	Provide information on methods to manage the impact
Other land management issues	Rubbish dumping, erosion, etc.
Works	List of actions and priorities within the block, as well as any staging requirements in relation to adjoining blocks.
Monitor the effectiveness of on-ground actions	For example, photopoints

Cost = \$4,000 per action plan

3.4 Revegetation

A strategic approach to revegetation was identified as a high priority in the Murray Mallee Local Action Plan (Pederick 1999) as it can help to address the major natural resource management issues in the region (Wilson 2001). The Pyap to Kingston project area has experienced a high degree of clearance in the past, particularly in the highland areas. This has resulted in an increase in the amount of dryland recharge or saline groundwater entering the river. By encouraging landholders and community groups to revegetate using locally indigenous species, not only does it bring back native plants and animals, but it may also help to lower water tables, reduce the effect of salinity, alleviate soil and wind erosion and improve the amenity of the district.

Objectives of on-ground revegetation works include:

- to establish buffer strips to increase the size of existing remnant patches;
- to plant corridors, stepping stones and other links between isolated patches of remnant vegetation; and

- to restore understorey (where appropriate) in degraded patches where only the tree layer remains.

Methodology

- Undertake a desktop assessment using current aerial photography overlain with roads, reserves, pathway alignments, underground services, built recreational facilities, and potentially, roadside vegetation and land use to identify patches of remnant vegetation which could be linked with the re-establishment of native vegetation along fence lines, road verges, drainage lines etc.
- Identify high priority target areas for revegetation in order to prevent wind erosion, enhance native vegetation, reduce recharge, establish vegetation corridors and combat soil salinity.
- Develop lists of plant species, as well as plant densities, appropriate for revegetation in the various communities present, both in highland areas and on the floodplain. (*Note: the Nature Conservation Society is developing benchmarks for the Murray Darling Basin. This publication, which will be available in the near future, provides descriptions of the communities present in this region, along with the expected species and structural diversity of the vegetation.*)
- Identify possible seed collection areas for revegetation projects.
- Develop a list of funding sources which potentially provide landholders with incentives to revegetate³.
- Develop a community education and awareness program to promote the benefits of revegetation.

Proposed cost = \$25,000

3.5 Bushland condition monitoring

The Nature Conservation Society's Bushland Condition Monitoring methodology provides a tool which can be used to assess the on-going effectiveness of management actions within priority vegetation areas. Criteria to assess condition include community type, plant species diversity, abundance of weeds, regeneration, tree health and plant structural diversity, as well as taking into consideration the size of blocks and connectivity to other patches.

Condition monitoring provides managers, whether they be volunteers, landholders, bushland owners, land managers or technical officers, with a tool that can accurately measure change over time in the condition of their bushland.

The Bushland Condition Monitoring Manual for the SA Murray Darling Basin region is currently being developed and is likely to be published in 2009.

³ The River Murray Forest project is a large-scale habitat establishment and biosequestration initiative. Investment in the forest will be sought from the community, private landholders, business and industry on a "two for one" basis.

Methodology

Condition monitoring sites to be established and initial monitoring undertaken in 3-4 highland priority sites and 3-4 floodplain priority sites.

Proposed cost = \$15,000

3.6 Other projects

Fencing

- Develop a scoring system which prioritises areas for fencing for biodiversity conservation.
- Provide landholders with a list of possible funding sources for fencing for biodiversity conservation.

Grazing impacts

- Assess and monitor the impact of grazing on all Crown land, particularly floodplains and wetlands and provide management options for reducing impacts.
- Establish and maintain experimental grazing enclosures and broader exclusion areas on the floodplain to protect native flora and fauna from total grazing pressure. Annual monitoring by photopoints and a full quantitative vegetation survey approximately every 7 years to look at recovery from, and response to, exclusion.
- Develop best practice guidelines for grazing in sensitive areas of both the floodplain and highland areas.

Recreation impacts

- Produce a Regional Code of Practice for recreational activities, including camping, off road driving, wood collection, speed boat use, house boat use, toilet facilities, rubbish dumping, etc.
- Develop interpretive signs to be placed around campsites and other popular gathering points along the floodplain to inform visitors of appropriate behaviour and particular environmental issues.

Ongoing tree health monitoring

- Establish transects and photopoints to quantify tree health on the floodplain.
- Undertake a bird survey throughout the district.

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Appendix A

Description of structural vegetation formations in the Pyap – Kingston Project area

DEH Vegetation Floristic Mapping (NVIS)**Description of structural vegetation formations present in the highland areas of Pyap – Kingston Project area**

- Yorrell (*Eucalyptus gracilis*), Red Mallee (*E. oleosa* ssp. *oleosa*) Mid open mallee woodland.
- Narrow-leaf Red Mallee (*Eucalyptus leptophylla*), *E. socialis* Mid mallee woodland.
- Gilja (*Eucalyptus brachycalyx*) +/- Red Mallee (*E. oleosa* ssp. *ampliata*) +/- Yorrell (*E. gracilis*) Mid mallee woodland.
- emergent +/- *Alectryon oleifolius* ssp. *canescens*, +/- *Myoporum platycarpum* ssp. Low open woodland.
- Bluebush (*Maireana sedifolia*) Mid sparse shrubland.
- Short-leaf Bluebush (*Maireana brevifolia*) +/- *Atriplex stipitata* +/- *Atriplex paludosa* ssp. *cordata* Low sparse shrubland.
- Spear Grass (*Austrostipa* spp.) +/- *Sclerolaena diacantha* +/- *Enchylaena tomentosa* +/- *Sclerolaena obliquicuspis* Low open tussock grassland.

DEH Vegetation Floristic Mapping (NVIS)**Description of structural vegetation formations present on the floodplain of Pyap – Kingston Project area*****Forests and Woodlands***

- *Eucalyptus camaldulensis* var. *camaldulensis* Mid open forest.
- *Eucalyptus camaldulensis* var. *camaldulensis* Mid woodland.
- *Eucalyptus camaldulensis* var. *camaldulensis*, *Eucalyptus largiflorens* Mid woodland.
- *Eucalyptus largiflorens* Low woodland.
- *Eucalyptus largiflorens* Mid woodland.
- *Eucalyptus largiflorens*, +/-*Eucalyptus camaldulensis* var. *camaldulensis* Mid woodland
- *Acacia stenophylla* Low woodland

Shrublands

- +/-*Maireana brevifolia*, +/-*Atriplex stipitata*, +/-*Atriplex paludosa* ssp. *cordata* Low sparse shrubland
- *Atriplex lindleyi* ssp. *lindleyi*, +/-*Sclerolaena muricata* var. *muricata*, +/-*Atriplex semibaccata* Low open shrubland
- *Atriplex rhagodioides* Mid open shrubland
- *Sclerolaena tricuspis*, *Sclerolaena brachyptera*, +/-*Brachyscome lineariloba*, +/-*Plantago cunninghamii* Low sparse shrubland
- *Muehlenbeckia florulenta* Tall shrubland
- *Muehlenbeckia florulenta* Mid open shrubland
- *Halosarcia pergranulata* ssp. *pergranulata*, +/-*Hordeum marinum*, +/-*Suaeda australis*, +/-*Disphyma crassifolium* ssp. *clavellatum* Low open shrubland
- *Halosarcia pergranulata* ssp. *pergranulata*, *Halosarcia indica* ssp. *leiostachya*, *Disphyma crassifolium* ssp. *clavellatum* Low open shrubland
- *Pachycornia triandra*, +/-*Disphyma crassifolium* ssp. *clavellatum* Low open shrubland

Sedgeland/Herbland/Forbland

- *Disphyma crassifolium* ssp. *clavellatum*, *Atriplex lindleyi* ssp. *lindleyi*, +/-*Eriochiton sclerolaenoides* Low sparse forbland
- *Typha domingensis* Tall open sedgeland

Grasslands

- *Phragmites australis*, +/-*Typha domingensis*, +/-*Schoenoplectus validus* Tall closed grassland
- *Eragrostis australasica*, *Muehlenbeckia florulenta* Tall open hummock grassland