Puccinellia
Perennial Sweet Grass

'Spring Herd on a Salt Flat' – James Darling

Puccinellia is a low input, perennial grass with high tolerance to salinity and waterlogging. It is ideally suited to sheep and beef enterprises situated in areas subject to dryland salinity.

Puccinellia – Perennial Sweet Grass

Puccinellia (*Puccinellia ciliata*) is a productive perennial grass that is very tolerant to both salinity and waterlogging.

Puccinellia provides excellent stock feed and typically supports 3 to 4 sheep per hectare. With good management and fertiliser, well over double this production can be achieved.

Puccinellia is best suited to saline areas with a shallow watertable and where rainfall is more than 350 mm.

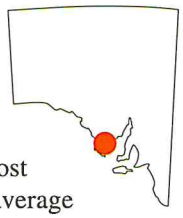
It will grow in areas previously covered by sea barley grass and where the soil has become bare.

Seedlings will tolerate inundation by shallow, fresh water for a short period.

The following case studies give an indication of the uses to which puccinellia can be put.

CASE STUDY

by Bruce McCallum, Edillilie, Eyre Peninsula



The property

The land at Edillilie comprises 1300 ha, most of which is arable and we have a 475 mm average annual rainfall.

The soils are grey sandy loam and red brown loam over yellow brown clay and the pH ranges from about 5.6 to 7.0

The enterprises

We mainly grow wheat, barley, pulses and canola and graze sheep for meat and wool production. We also harvest medic seed as an opportunity crop.

Salinity history

Salinity initially developed in the lower lying areas being concentrated around creek lines and other natural drainage areas.

The salt-affected area has spread over the past 20 years from about 30-40 ha to 100 ha. The first indication of salinity showed as reduced productivity in crops or pasture and was often associated with waterlogging.

Our productive pastures in these areas were replaced with sea barley grass and then eventually bare scalds.

Where reclamation has been attempted, it has been successful using puccinellia and tall wheat grass.

Establishment

To prepare the area to be sown we try to ensure there is adequate drainage and that sea barley grass is controlled in the year before sowing puccinellia.

The area to be sown is spray topped and hard grazed and, after the break, any germinating seeds are sprayed.

We broadcast DAP at 75 kg per ha before cultivating and seeding in one pass. We use large modified shares as deep as possible to leave the soil cloddy with well defined ridges and seed at the rate of 10-12 kg per ha is dropped onto the soil surface. Seeding is done as slowly as possible.

We consider earth mite control to be very important in the establishment year.

Management

We graze puccinellia for three months in autumn at 32 dse per ha (equivalent to 8 dse per ha per year) but generally not in the first year. 40-50 units of nitrogen are applied soon after the seasonal break and a similar amount in August-September.

Above: A good stand of puccinellia after two years.
Below: Harvesting in progress.

We have gradually increased the amount of nitrogen to increase production. The temptation to graze puccinellia in late winter and spring is resisted as this damages the stand, sheep can pull it out and can also compact the ground, although cattle do not graze it as hard.

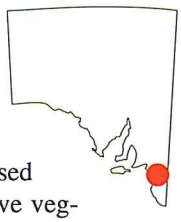
Summary

Puccinellia's advantage lies in its ability to boost stocking rates and/or increase the cropping area. It also benefits legume pastures, allowing them to become more established before grazing and it tolerates salinity better than tall wheat grass.

In terms of carrying capacity we have found that it outperforms saltbush and tall wheat grass, providing establishment and management procedures are properly carried out.

CASE STUDY

by James Darling, Duck Island, Keith



The property

This comprises 3643 ha of which 1218 ha is used for agricultural production. The rest is native vegetation and wetlands.

Annual rainfall is 400-450 mm and the major soil types vary from sand over limestone/clay in the flats and watercourse country, to deep non-wetting sandhills.

The enterprises

Principally crossbred cattle and production of puccinellia seed.

Saltland agriculture

The watercourse country of the Upper South-East is traditionally saline.

Farming practices are based on keeping salt at its lowest and least influential level.

Widespread flooding in 1981 concentrated salt levels at or near the surface decimating established pasture. Duck Island lost most of its wet country pasture including a highly productive strawberry clover seed block.

The demise of these pasture species in 1981, with the exception of areas of puccinellia, underlined the need to use the plant to its best ability.

Puccinellia is now the pasture base for more than 600 ha of Duck Island's agricultural land. Puccinellia provides predictable, minimum management, high protein feed for Duck Island's simple and efficient cattle operation calving 180 to 200 top performance cattle every six months.

Puccinellia history

Seed was obtained from WA in 1978 and a trial area of 4 ha was sown. The success prompted puccinellia to become the essential ingredient of any wet country pasture on Duck Island. We have been reaping quality seed since 1982.

Establishment

Newly established puccinellia plants are small and particularly susceptible to competition especially from sea barley grass which needs to be controlled.

At Duck Island the seed is sprayed from an airseeder's small seeds box at 4 to 10 kg per ha (depending on salinity levels) onto the surface of a seedbed cultivated to a maximum depth of 7-10 cm, and then rolled.

The exceptions are swamps, bare scalds and obviously saline areas which are roughly cultivated and sown without rolling.

We sow as soon as practicable after the seasonal break. Spraying for red-legged earth mite is not essential on Duck Island's expansive pure puccinellia stands, but whether others need to do this depends on observation and local knowledge.

Between 100 and 150 kg per ha of superphosphate is recommended in the establishment of puccinellia.

In established stands we use 19:10:0:13 at 50 kg per ha annually after opening rains. A spring application of urea at 50 kg per ha is also recommended, especially for seed production.

Puccinellia ... More Protein

Management

Puccinellia should be used as the first step in the rehabilitation of salt affected areas. We fence the area to be sown and install shallow drains to ensure floodwaters move and do not become stagnant.

Plant emergence will vary, taking up to two months on bare scalds and we do not graze new stands until the following autumn.

If the stand is to be used for seed production, livestock need to be removed in mid- to late spring.

Seed yields vary from 100 to 165 kg per ha depending on the season.

Summary

We have found puccinellia to be a resilient, highly palatable, dependable perennial grass with excellent feed value.

It responds quickly to opening rains, thrives in winter and spring flooding conditions and has significant feed value in autumn due to the retention of sappy green stems in what appear to be dry plants.

For successful land reclamation, the maintenance of a dense cover of puccinellia over the heat of summer limits evaporation, assists in management of the watertable and significantly reduces the amount of salt brought to the surface.

CASE STUDY

By Rob Smyth, Camden, Cooke Plains

Property size

We have 1800 ha, most of which is continuously cropped. The soils are flat to undulating sand over limestone with some gypsum deposits.

The enterprises

We concentrate on wheat, barley, pulses, canola, hay and certified field crop seed and Merino sheep.

Salinity history

Some areas of the farm have been historically saline. However, the area of samphire swamps has increased, especially since the early 1980s. The saline water table has risen causing low lying sand plains to become prone to salinisation.

Puccinellia history

I first heard about this plant in the mid 1960s and we tried to reclaim an area that had been cropped but lacked the experience at the time to make this a success.

In the past five years, my interest in the plant has heightened and we are now able to establish it without difficulty.

Establishment

We spraytop the area to be sown in the spring of the previous year and this is followed by a knockdown application and cultivation in autumn-winter.

We seed with a combine placing seed and fertiliser in a furrow and use press wheels. Seed is sown at 4-6 kg per ha with 50 kg per ha of DAP.

If red-legged earth mites are present in high proportions we use an insecticide pre-cultivation and post-seeding.

Management

Most of our puccinellia stands are still "young" but we have found that the plant responds to urea topdressed at 50 kg per ha in mid-winter and that it has to be grazed judiciously to ensure cover is present over summer.

In 1995 puccinellia areas in cereal paddocks were opportunity harvested following a wet winter and very dry spring. They yielded about 200 kg per ha at 96 per cent purity.

The puccinellia was reapt with an open-front header using an air-reel and Vibramat. Harvesting is fairly straightforward but it can be difficult to thrash all the seed from the straw.

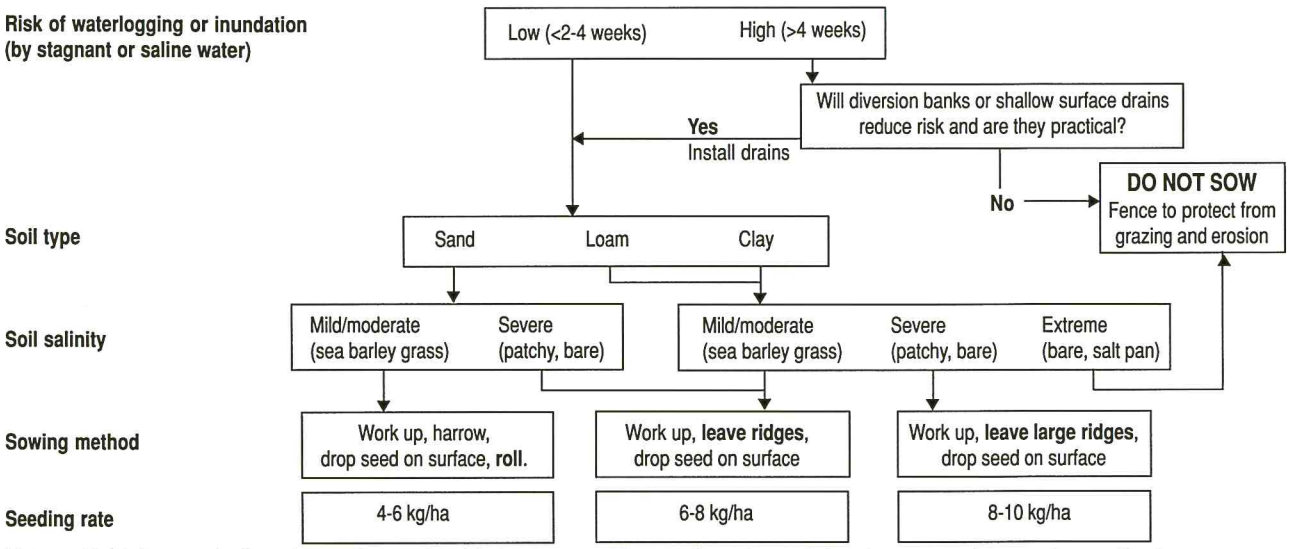
Summary

The establishment of salt-tolerant pastures is linked with the profitability of livestock and when the latter improves we can expect to see more puccinellia sown. This will also occur if reliable outlets for seed sales are developed overseas.

It is much easier and cheaper to establish than other salt tolerant pastures. Tall wheat grass is not as well adapted to saline land and tends to grow tall and rank so you really need cattle to graze it.

We have found puccinellia to be more variable in its growth than saltbush but also more productive if fertilised well. In wet years it produces large amounts of good quality, palatable fodder.

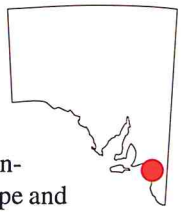
Guidelines for sowing puccinellia



Note: Guidelines only. Local experience should also be considered when determining the appropriate sowing method.

CASE STUDY

by Jeff Gowling, Kamann, Tintinara.



The property

The property size is 725 ha in a 450 mm rainfall zone. Sandy loam is the dominant soil type and the land is flat to undulating with some sand rises.

Main enterprises

We graze Merino sheep, produce crossbred lambs and also Angus cross beef cattle. Our cropping programs are based on the production of malting barley, lupins and lucerne for seed sale.

Salinity history

The property was purchased about 16 years ago and at the time there were 2-4 ha salt affected. As with other properties in the upper South-East, the saline area has spread.

Puccinellia history

Initially and before I recognised salinity as the problem I thought the lack of production might have been due to insufficient nutrients and so fertiliser rates were increased. Then soil tests revealed that this wasn't the problem. A neighbour had puccinellia growing on problem areas and this is where we first saw it.

Establishment

We spraytop with Roundup® in the year before sowing to control weeds such as sea barley grass. The area to be sown is then worked up after the opening rains and we re-spray any germinating weeds. Seed is sown at 3 kg per ha and the land is then given a light harrow and rolled. DAP plus sulphur is broadcast at 100 kg per ha. If barley grub is present we spray Fastac® at 100 ml per ha. Red legged earth mite have not proven to be a problem on our farm.

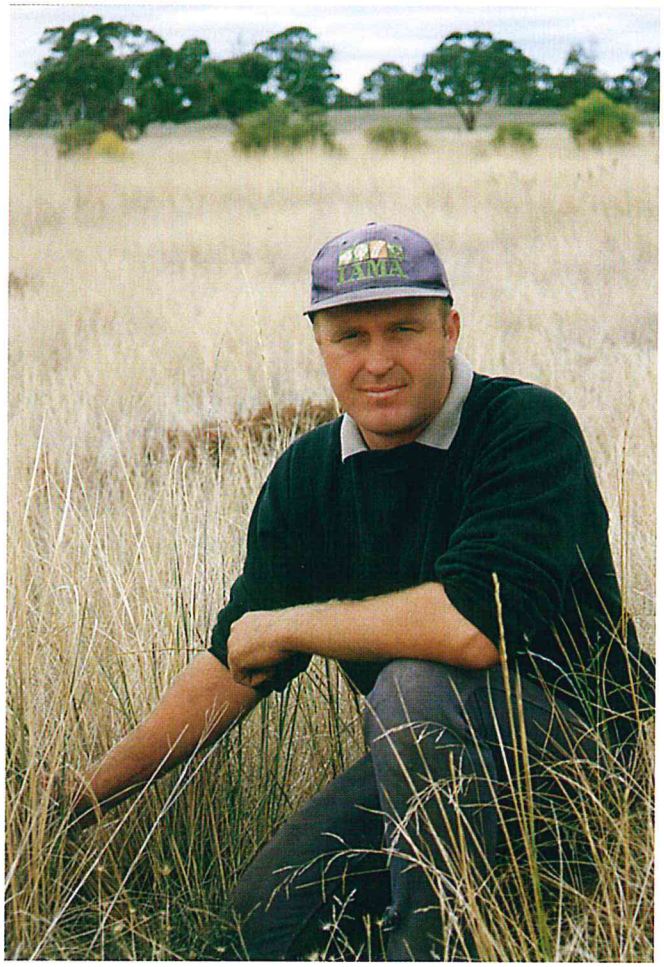
For sowing puccinellia we take the hoses off the bottom of the small seed box and let the seed drop about 1 m onto the soil surface. Scattering the seed in this way seems to give a better stand.

Puccinellia ... Productivity

Management

The intensity and frequency of grazing with sheep and cattle depends on seasonal conditions. We have moved to later lambing and have found that puccinellia pastures are good for late lambs and summer-autumn shorn sheep due to the lack of grassy weed seeds in these stands. Puccinellia has the ability to out-compete these weeds.

Fertiliser (19:13) is spread at the end of July at 50 kg per ha on predominantly those areas where seed is to be reapt.



Jeff Gowling in a puccinellia and tall wheat grass pasture.

Over the years we have found that it is important to grow lucerne and puccinellia as supporting enterprises.

The lucerne is sown on the rises and, by having good stands on these, the amount of water moving from the recharge areas to the discharge areas on the flats where the puccinellia is grown, is reduced. This combination minimises the likelihood of the flats becoming waterlogged.

Puccinellia seems to last well and we have some stands that are productive seven years following sowing.

Summary

Puccinellia is a valuable pasture plant for us and is helping to restore productivity to saline land. It is easier to manage than tall wheat grass, has higher protein levels and is more palatable to stock.

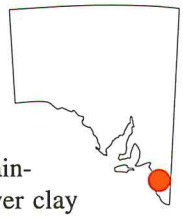
Table 1. Feed value of puccinellia sampled at various stages of growth.

Growth stage	Vegetative* (end August)	Flowering* (end Nov.)	Maturity* (mid-March)	Typical range # (maturity)
Protein (%)	12	9.2	5	4.7 - 6.2
Digestibility (%)	78	60	61	45 -60
Metabolisable energy (MJ/kg dry matter)	10.7	8.1	8.3	5.5-7

** Data from James Darling. # Data from Tim Herrmann.*

CASE STUDY

by Kim Shipway, Clifton Hill, Lochaber



The property

This comprises 500 ha in a 560 mm annual rainfall area. The major soil types are sand over clay and sandy rises.

Enterprises

We graze beef cattle and sheep for wool and prime lamb production.

Salinity history

Over the past 10 years, there has been a gradual change from what were once clover dominant flats to sea barley grass and salt water couch. The first indication of a salt problem was the death of Pink Gums on the flats to the extent that very few now remain. The stock carrying capacity of the flats has approximately halved since the onset of salinity but we are hopeful that stocking rates will recover now that puccinellia is being sown.

Puccinellia history

We first heard about puccinellia through involvement with the Lochaber-Woolumbool landcare group and then saw it in trials which the group initiated with senior soils officer Tim Herrmann in 1993.

Establishment

The paddock we have sown with puccinellia was spraytopped in mid-October 1994 and burnt. Large patches of pin reeds and salt water couch were ripped and cross-ripped during summer using a three point linkage chisel plough. The couch was harrowed into heaps and burnt and all paddock preparation was done dry.

Any germination after the break was sprayed with Roundup.

Just before seeding the paddock was rolled to level it out; plain super was broadcast at 110 kg per ha and red-legged earth mite were also sprayed before seeding and again about two weeks after germination. This may not always be possible as some areas of the paddock are frequently inundated.

Using a conventional sod seed drill, puccinellia was dropped onto the soil surface at 5 kg per ha, covered with light harrows and rolled. Germination and establishment were remarkable given that we had more than 250 mm in June and July, 1995.

Renovated pasture containing puccinellia and strawberry, Balansa and Kyambro clovers, with some phalaris.

Management

200 ewes and spring dropped crossbred lambs were put on 16 ha for more than two months from late December after the puccinellia had set seed. Productivity of the pasture was such that the lambs were finished off in that time.

Puccinellia pastures are especially soft on young lambs as there is no sharp seed to contaminate their fleeces and skins. We have found that it is very responsive to moisture in terms of recovery after grazing – even dewy mornings.

Summary

We have only been growing puccinellia for two years so we don't have information available on responses to various types and levels of fertiliser although I am sure we could boost productivity by applying nitrogen in spring.

With the increase in salinity in our flat country we have changed our renovation program to include puccinellia as our main grass. Due to its productive ability, its palatability and apparent persistence, we think it has a definite place in our farming system. In combination with strawberry and other clovers we will be sowing more of it.

Even after 5 mm of rain in March, and some dewy mornings, puccinellia started to green up by April, 1997.

PUCCINELLIA MANAGEMENT




Above: Puccinellia in a saline, low rainfall area at Darke Peak on Eyre Peninsula – sowing in May; growth by August, close-up in August; nine months after sowing.

Establishment

The most appropriate establishment method depends on the soil type, degree of salinity and rainfall (see the chart 'Guidelines for sowing puccinellia' and the experiences of practical farmers in the Case Studies).

Preparation

Fence the area to be sown. If waterlogging is a problem install shallow drains where practical to remove excess water. Diversion banks will reduce the movement of runoff water onto the area. Consideration should be given to the disposal of drainage water.

Weeds such as sea barley grass must be controlled. Best results are obtained by chemical topping the previous spring. Other options include burning, knockdown herbicide and cultivation. Use a combination of methods.

Cultivate in early autumn. On loamy or heavier soil, leave the ground as ridged as possible, particularly where soil salinity is high. The ridges allow better leaching of salt and provide young seedlings some protection from waterlogging.

Sowing

Drop seed onto the surface of a freshly worked soil. Avoid harrowing. On light sandy soils, rolling after sowing improves establishment through better seed-soil contact and retention of moisture.

Sow in autumn after the opening rains. If the site is likely to become untrafficable after rains, dry sowing should be considered. Ground preparation and sowing in one pass is possible under some conditions and provides greater flexibility in areas with high salinity (see photos at top of page). In higher rainfall areas (above 475 mm) sowing in late winter to early spring has given promising results.

Seeding rate

4-10 kg/ha. Use the higher rate where salinity is more severe and on heavier soils.

Pests

Monitor and control red-legged earth mite during establishment, and barley grub during the growing season.

Fertiliser

If the site has poor fertiliser history or has been eroded, apply 100-150 kg/ha of superphosphate or equivalent at sowing. Nitrogen fertiliser in late winter will boost productivity. Apply 20 to 30 units of N per ha (about 40 to 60 kg/ha of urea).

Late sowing in the South-East – after a wet winter sowing in early spring can still give good results.

PUCCINELLIA ESTABLISHMENT COSTS

The approximate costs of establishment for a typical puccinellia pasture is given below.

Item	cost/ha $
Chemical topping	15
Work up	15
Seed (6 kg @ $5/kg)	30
Pest control	5
Total cost	**$65**
Additional costs if required:	
Knockdown herbicide pre-sowing	$15
Phosphate fertiliser	$25
Rolling	$5
Extra seed (4 kg)	$20
Annual fertiliser costs	
Grazing (50 kg/ha urea)	$25
Seed production (100 kg/ha urea)	$50

Under most conditions, costs of establishment are recovered in two to three years.

Grazing

Allow 10 to 12 months for plants to establish before grazing. Most economic benefit is gained if puccinellia is used to fill the autumn feed gap reducing the reliance on supplementary feeding. Established puccinellia will tolerate hard grazing, but should be allowed to mature and set seed at least every two to three years.

As a green plant, puccinellia has excellent feed quality, with high protein and energy content. When dried off in summer, it retains its high digestibility and energy through to autumn (see Table 1). Puccinellia has a low salt content, and is an ideal complementary feed for stock grazing high salt feed such as saltbush.

Nitrogen fertiliser

Puccinellia dominant pastures will respond to nitrogen fertiliser and this is the key management strategy to increase productivity.

The benefits of nitrogen application include:–

- Increased productivity through the promotion of tillering and improved growth per tiller.
- Improved long term survival of puccinellia in harsh conditions. The plant is stronger, and more vigorous and able to tolerate higher levels of salt, flooding or waterlogging.
- Increased development of dormant tiller buds. These become tillers in the following year and this 'sets' the plant up for higher productivity.
- Increased feed quality. Digestibility is often increased but there is little effect on protein unless nitrogen has been applied above the growth demand of the plant.
- Increased seed production. This has a major impact on returns if the pasture is harvested for seed.

Application

The best rate and timing of nitrogen fertiliser application depends on annual rainfall, and seasonal feed requirements. There are a number of strategies that can be used.

1 Late autumn to early winter (May to early June).

Fertiliser is applied on the opening rains (within a week or so). Puccinellia will respond rapidly to the nitrogen while temperatures are still relatively warm.

Advantages: A useful strategy to provide early feed or more grazing in winter. Allows other pastures to 'get away' while puccinellia is grazed.

Disadvantages: Nitrogen may be leached or lost if waterlogging occurs within 4 weeks of application.

Table 2. Suggested rates of nitrogen fertiliser for puccinellia pastures.

Rainfall (mm)	350	400	450	500
Nitrogen (kg/ha)	15-25	20-30	25-40	30-50
Urea (kg/ha)	35-50	40-60	50-80	60-100

Mid-summer grazing of a puccinellia pasture in the South-East.

2 Mid-winter (July to early August).

This is the most appropriate strategy for drier areas (<400mm) that are unlikely to become excessively waterlogged and cause loss of nitrogen.

3 Late winter/early spring (August to early September).

A sound strategy to promote rapid growth in spring following grazing in winter, and provide adequate ground cover or dry feed over summer/autumn. It is also useful to increase seed yield for harvesting.

4 Split application in autumn and late winter.

The best option for maximum productivity and where seed production is the primary objective. The extra cost and time required to apply the fertiliser limits the widespread adoption of this strategy.

Suggested rates of nitrogen fertiliser for puccinellia pastures are given in Table 2. The higher rates are recommended if the pasture is used for seed production.

The trial plots below show the effect of nitrogen fertiliser (increasing applications from left to right).

For further information contact:

Your local Primary Industries SA district office
Saltland Solutions Inc. (a grower-based group) (08) 8757 4067

Produced by Tim Herrmann and Nick Booth, of PISA, with assistance from the National Landcare Program, Coorong District Council and the Coorong and Districts, Lacepede/Tatiara and Lower South-East Soil Conservation Boards.

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