Salt-tolerant pasture and fodder species

Salt-tolerant species in Tasmania

Saline land in Tasmania is generally in valley floors and along drainage lines where there is more moisture than on adjacent slopes. As a result, perennial plant species can thrive due to better soil moisture. However, soils in these areas are often waterlogged for extended periods, so waterlogging tolerance is also a requirement.

The following species are suited to Tasmanian conditions:

Species	Cultivars	Salinity tolerance levels, ECse* (dS/m)[1]
Phalaris	Australian, Sirosa, Holdfast, Uneta	<6 dS/m Moderate
Persian Clover	Nitro Plus, Prolific	<8 dS/m Moderate
Balansa Clover	Bolta, Frontier	<8 dS/m Moderate
Strawberry Clover	Palestine, Onward	<10 dS/m Tolerant
Winter Active Fescue	Flecha, Prosper, Resolute	<10 dS/m Tolerant
Summer Active Fescue	Advance, Au Triumph, Demeter, Quantum	<10 dS/m Tolerant
Tall Wheat Grass	Dundas, Tyrell	12-25 dS/m Highly tolerant
Puccinellia	Menemen	>25 dS/m Highly tolerant
Mediterranean Saltbush		Highly tolerant

* ECse is the Electrical Conductivity of a saturation extract.

These species have varying salinity and waterlogging tolerances and importantly, have different establishment and management requirements. Experience in Tasmania and elsewhere shows that establishment of these species is difficult and risky. The saline and soil moisture conditions often make it difficult to provide a good environment for sowing and the seedlings are generally weak competitors.

Phalaris is a persistent perennial with good tolerance to drought, waterlogging and pasture pests. It is best suited to heavy clay soil. Phalaris must be grazed hard in spring to avoid accumulating large amounts of unpalatable leaf and stem. Autumn grazing should be managed to reduce the risk of phalaris staggers.

Persian Clover (sometimes called Shaftal Clover) is an annual. The subspecies *resupinatum* has a good level of hard seeds and is suitable for permanent pastures. The species is intolerant of acid sandy soils, but highly tolerant to waterlogging. If dominant in a pasture there is a risk of bloat in cattle.

Balansa Clover is a hard-seeded annual. Regeneration has been unreliable in Tasmania as our mild summers are slow to break hard seed coatings. It is susceptible to red-legged earthmite and has a high bloat risk. Balansa clover is not suited to deep sandy soils and it is highly tolerant of waterlogging.

Strawberry Clover is a long-lived prostrate perennial that tolerates poorly-drained, moderately alkaline and saline soil. It is favoured by continuous grazing that reduces competition from grasses, as it is not vigorous as a seedling. Establishment in competition with the grass species recommended for saline areas will be uncertain, but it is still recommended in a seed mix for production in the first two years.

Fescue grasses are perennials and persistent once established (seedling vigour is low). Summer active cultivars are well suited to heavy-textured wet soils. Winter active cultivars are best suited to sites with extremely dry summers.

Tall Wheat Grass is a drought-tolerant, summer active, tussock-forming perennial. It is well suited to areas growing Buck's Horn Plantain and Sea Barley Grass. It will not persist in soils that are waterlogged over spring and into summer. Seedlings are weak, so weed control before sowing is essential. If sown with Balansa Clover, stop grazing at the first sign of flowering of the Clover and then crash graze when seed set is complete. Do not graze waterlogged sites in winter. This species must be grazed heavily in spring to prevent it becoming rank.

Puccinellia is a winter active perennial grass. It is the most salt-tolerant of all commercially available grasses and is suited to areas bare due to salinity. It will grow in areas too waterlogged for Saltbush and Tall Wheat Grass. The plant should not be grazed in the first year and only lightly grazed in the second.

[1] Borg, D. 2005. Pastures for Discharge Areas. Agriculture Notes, Victorian Department of Primary Industries. AG0386

Saltbush. Trials in Tasmania have shown that Mediterranean Saltbush will establish and provide valuable livestock fodder in very saline environments (even salt scalds). However, persistence under grazing is less certain, except in low to non-saline environments. Plants will establish from seed or seedlings. They are not very tolerant of waterlogging; in very wet sites seedlings should be planted on mounds, in rows 1.5–2.0 m. apart, with plants spaced at around 2 metres. Rotational grazing is essential. The leaves can have very high protein levels, but high salt concentrations in the leaves limit stock intake. Ensure stock have adequate drinking water.

Paddock preparation

Soil testing is essential to determine salinity levels and fertilizer requirements. Fence areas to be sown, as grazing will need to be restricted for a relatively long period because these species are slow to establish. Surface drainage is also likely to assist establishment and production, but discharge of saline water may create difficulties for downstream water users (see Technote 5). Raised beds for permanent pastures in saline areas are being trailed in SA.

Spraytop in spring to reduce seed set of annual species. Spray again after the autumn break to get a total kill and, preferably, direct drill to minimise soil disturbance. Weed control before sowing is crucial as these species are weak competitors. The soil in saline areas is usually very susceptible to erosion, so there should be minimum cultivation. Scarifying to 10 cm will provide some soil tilth and encourage some leaching of salts. Rolling if the soil is dry will improve seed-soil contact, and thus establishment.

Sowing the pasture

Saline areas are generally variable, so it is best to sow a mix of species; the more salt-tolerant species will colonize the highest salinity areas. Select only one cultivar per species and mix the seed for sowing.

For low salinity areas a suitable mix is[2]:
- Dundas Tall Wheat Grass, 6 kg/ha
- Advance Fescue, 10 kg/ha
- Phalaris, 2 kg/ha
- Bolta Balansa Clover, 0.5 kg/ha
- Palestine Strawberry Clover, 1.5 kg/ha

For moderately saline areas a suitable mix is:
- Dundas Tall Wheat Grass, 10 kg/ha
- Bolta Balansa Clover, 1 kg/ha
- Palestine Strawberry Clover, 2 kg/ha
- Puccinellia, 6 kg/ha.

For highly saline areas sow:
- Puccinellia, 6 kg/ha
- Dundas Tall Wheat Grass, 10 kg/ha
- No legumes are suitable for high salinity areas.

In areas with low pH the seed should be drilled with lime super. Legumes must be inoculated with the appropriate rhizobia and are often pre-inoculated by local seed merchants (but check the time in storage). Additional amounts of phosphorus and potassium will generally aid establishment and subsequent production. Pasture pests need to be monitored pre and post emergence.

Seed of Tall Wheat Grass and Saltbush must be fresh, as germination declines rapidly if the seed is more that two years old. As a general rule increase the sowing rate for the most saline areas, particularly of the most tolerant species, and consider double-drilling these parts of the area to be sown.

Pasture management

Most of these species recommended for saline areas have low seeding vigour, so weed competition must be reduced by spraying in the lead-up to sowing. Pest control, particularly of red-legged earthmite is also crucial. Grazing must be delayed and perhaps avoided in the first year to avoid compaction and pugging, allow plants to develop adequate root systems, and to avoid young plants being pulled out.

These pasture species require top-dressing with fertiliser in the same way as normal pastures. The grasses in particular will respond to both phosphorus and nitrogen applications in autumn and spring. Trials in South Australia showed that nitrogen fertiliser increased carrying capacity of Tall Wheat Grass by 2 dse/ha. Potassium may be needed for legumes; use soil tests to determine requirements.

Balansa Clover is unlikely to persist more than 2 years where grazing is managed to get best performance from the Tall Wheat Grass.

Weed risks

Tall Wheat Grass has established as a weed in riparian zones on the Mainland, so caution is necessary. Avoid planting in a buffer zone at least 20 metres wide adjacent to waterways, wetlands and stands of native vegetation. The simplest approach is to manage grazing so that plants do not set seed. Once established, graze from spring through summer and into autumn. This has the added benefit of preventing a decline in pasture quality, as plants become rank and unpalatable if left to flower.

Puccinellia also has the potential to become invasive like Tall Wheat Grass. Allow buffer zones, particularly to public land and areas of native vegetation.

Further reading. Barrett-Lennard, E.G. 2003. Saltland Pastures in Australia. A Practical Guide.

[2] Advised by Eric Hall, TIAR, 2006

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