PRODUCTIVE PERENNIAL PASTURES FOR SALINE LAND

CASE STUDY

"A community approach to a shared issue"

PREPARED BY

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In October 2019, the Patterson family took part in Cranbrook's Saltland Master Class, organised by local Grower Group, the Gillamii Centre and the Department of Primary Industries and Regional Development (DPIRD). The Patterson's Burnley Downs farm is located north-east of Cranbrook town, in the Shire of Broomehill-Tambellup, situated in the Great Southern Region of Western Australia, 320km south of Perth.

The property is situated within the Balicup Wetland System, a series of naturally saline, seasonal lakes and is designated as a wetland system of national importance. The district overall has a natural tendency for waterlogging, and subsequently salinity, as the water moves slowly from the north-east to the south-west towards Racecourse and Balicup Lake. The natural waterlogging and saline characteristics of the area have been further amplified as land clearing has taken place, changing the hydrology of the catchment. With such a large area of the property falling within this system and considered saline and/or prone to waterlogging, the Patterson's were looking for options to manage these issues while also keeping the area in production.

The aim of the Master Class was to provide farmers and associated industry with the knowledge and skills to begin to confidently plan and implement a successful saltland pasture grazing system. On day two of the workshop participants attended a 'Challenge Site' on the Patterson's farm, where salinity and waterlogging had been identified as the major factors limiting production.

Participants were tasked with using skills developed in day 1 of the master class to develop a plan for a saltland grazing system on the site. Following on from the workshop and after further consultation with the project support team, the Patterson's decided to establish a 43-hectare site as part of the larger 600 hectare area.

SITE DEISGN & ESTABLISHMENT

The site design was split in two sections (Figure 1) due to varying salinity levels, as identified by the EM mapping of the farm in Figures 2 and 3. Section 1 was slightly more saline with a tendency for waterlogging (in wet years), therefore, in addition to selecting an understory of suitable perennial pastures, twin rows of saltbush in an alley design were also included to allow for greater water-use efficiency. Each twin row alternated between Anameka saltbush seedlings and a seed mixture of local old man, wavy and river saltbush to be direct seeded. Section 2 was relatively fresh; however, the Patterson's had noted the encroaching salinity and the salinization of a once fresh dam located within the area. Section 2 comprised of a different perennial pasture selection for the more favourable conditions, providing a higher feed value, *see Tables 1 and 2 for further detail.*

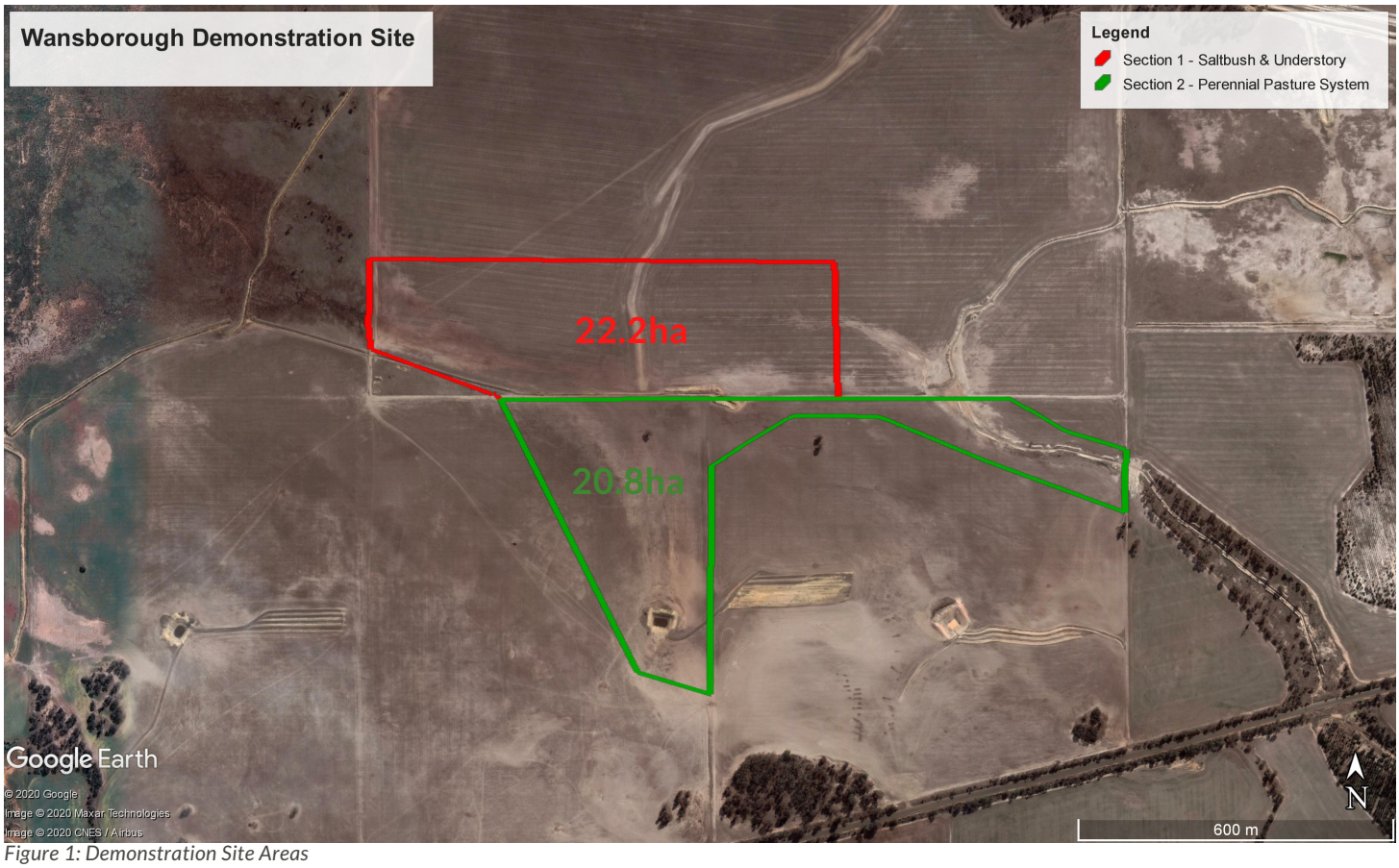


Figure 1: Demonstration Site Areas

The alley design, along with the high diversity of pasture species selected for the site was to provide the Patterson family with an example of the range of species available and to demonstrate how they would perform on their farm, with hopes of encouraging the continuation of work across the larger salt-affected area.

The site was established on the 26th and 27th of August 2020 with the Patterson family and project team. Rainfall for the month of August, recorded from the nearby DPIRD Weather Station (Stirlings North) was 69.4mm in the lead up to establishment. This meant the soil was moist and seeding/planting conditions were favourable. The two sections where seeded together, using the farms air seeder with the associated mix on the morning of the 26th. Following on from this, local farmer, Ian Walsh mounded the twin alleys for both the saltbush and seed with his Kimseed Seeder, seeding every alternative twin row only.

The remaining twin rows were hand-plated with Anameka seedlings every 3 meters using Pottiputki planters. Section 1 was then fenced off to exclude stock while Section 2 has been left open as adjacent paddocks are in crop and the pasture can be grazed in conjunction with the stubble in the summer and autumn months.

Checklist for Planning you Saltland Pasture System

- ✓ Understand how the ground & surface water is moving through the property/site
- ✓ Know your soil composition
- ✓ Determine if your site is also prone to waterlogging
- ✓ Test your soil (EM38 or EC1:5) and water salinity (ground water)
- ✓ Identify any indicator species that are persisting on the site
- ✓ Determine what you want to achieve on the site

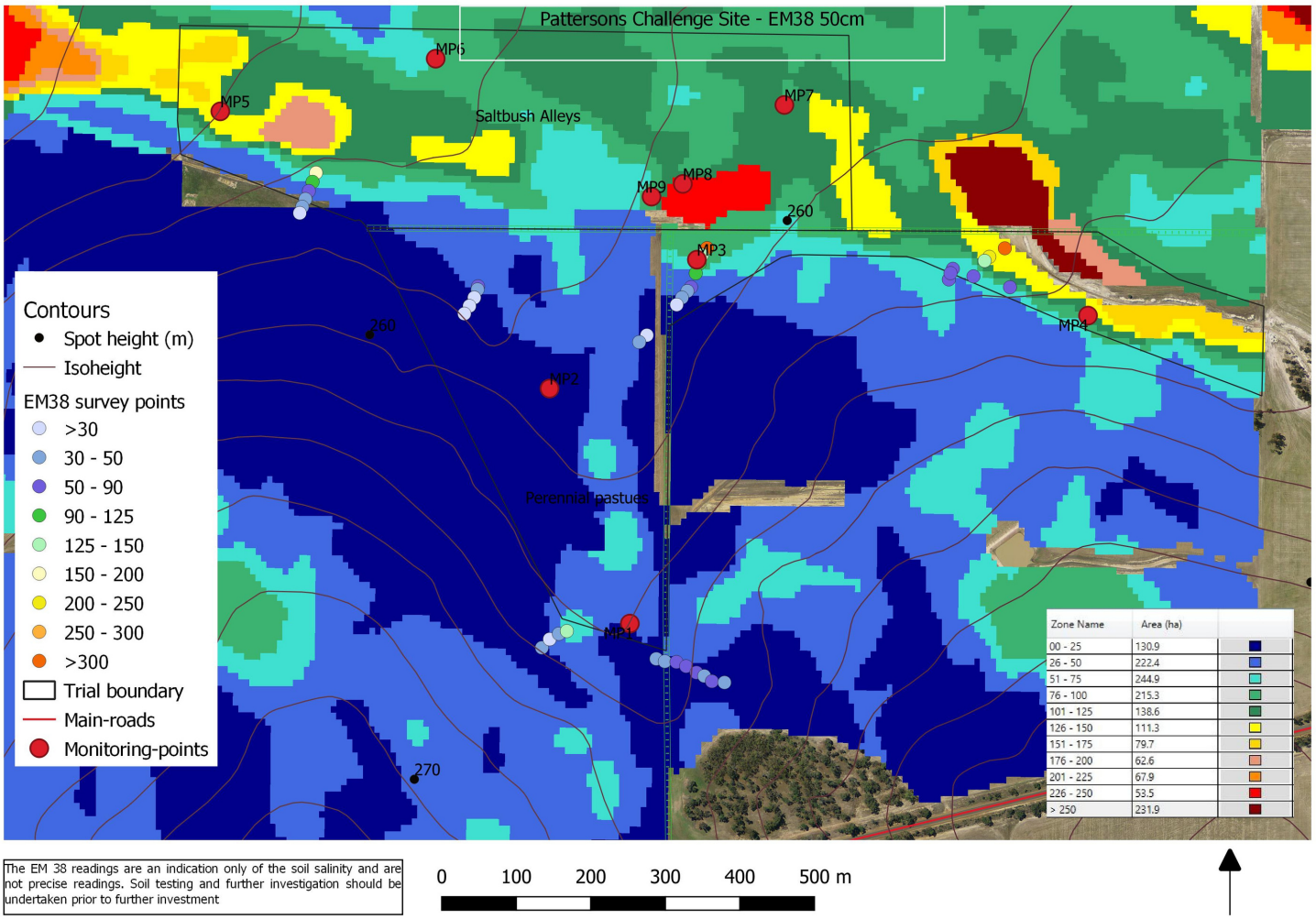


Figure 2: EM38 50cm Measurements

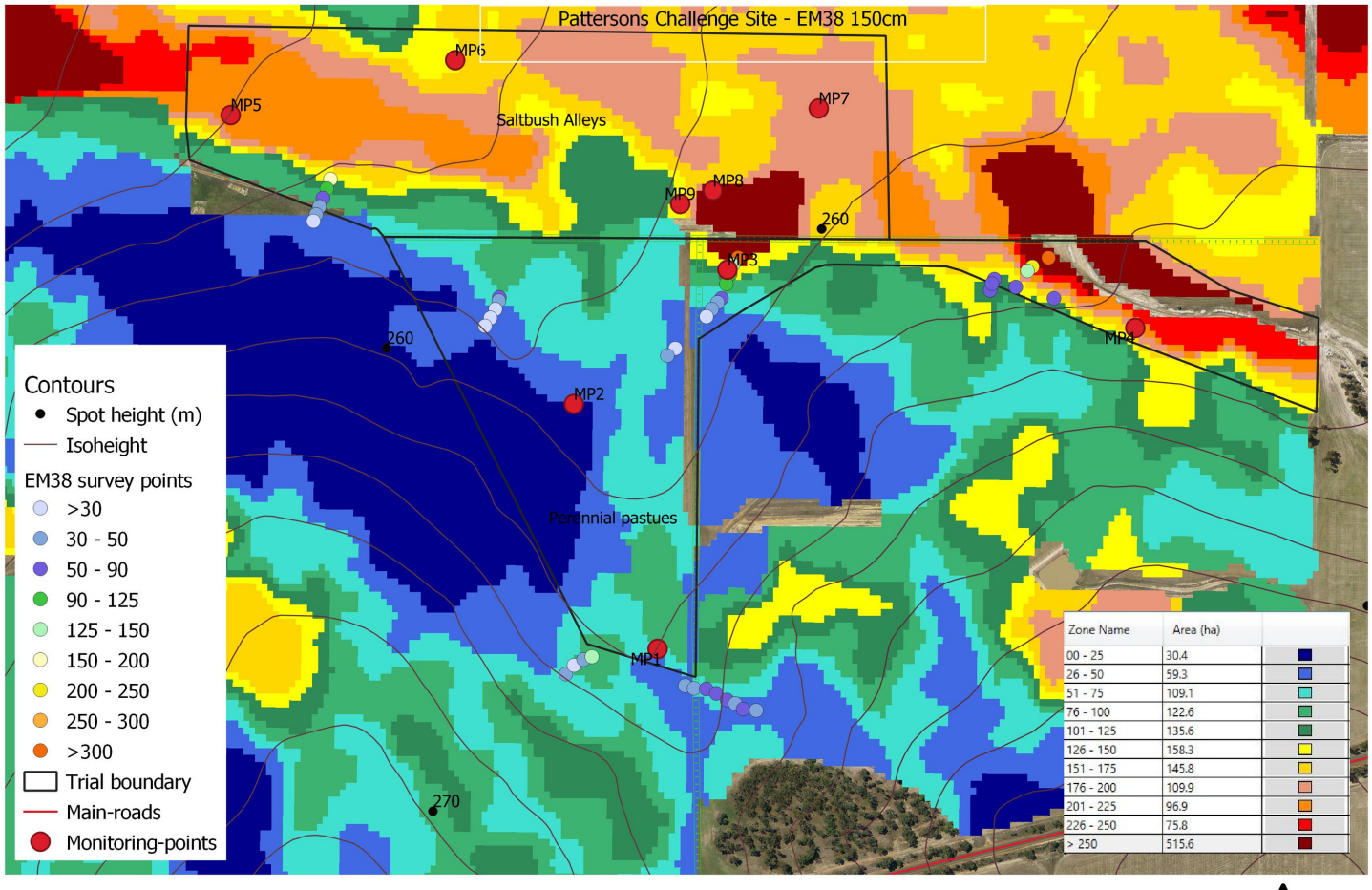


Figure 3: EM38 150cm Measurments

Table 1: Section 1 Site Design & Establishment Summary
(Saltbush alleys and perennial pasture understory, 16 ha, total site area 22.2 ha)

	Species Selection	**Establishment Design** ***Established on the 26th & 27th of August 2020***
Perennial Understory	1. Tall Wheat Grass Seed (10kg/ha) – 160kg total 2. Kikuyu Seed (200g/ha) – 3kg total (supplier quantity - rounded down) 3. Puccinellia Seed (1kg/ha) – 20kg total (supplier quantity - rounded up) 4. Messina Seed (3kg/ha) – 50kg total (supplier quantity - rounded down) + 1.25kg Peat Messina + 250 Alosca Sheep (for both sites)	Double knockdown of 22.2 hectares with glyphosate prior to establishment Entire 22.2 hectares was seeded prior to saltbush rows being established Pasture seed was mixed and sown using an air seeder
Alley 1: Seedling Twin Row (1st Alternative Row)	3900 Anameka Saltbush Seedlings	Twin mounded rows using niche seeder. Row length of 650m, 10m inter-rows with twin rows 2 m apart. 19 twin rows total (38 individual rows). 10 m buffer/track from fence edges to the first rows **1st Alternative Row (9 twin rows, 18 total)** • Anameka saltbush seedlings at 3m spacing (niche seeder to mound prior to handplanting) • 18 rows X 650m = 11700m • 11700m with seedlings at 3 m spacings = 3900 seedlings **2nd Alternative Row (10 twin rows, 20 total)** • Direct seeded (niche seeder) • 650m X 20 rows = 13km total • Seeding rate at 1kg/ha = 16kg
Alley 2: Seed Twin Row (2nd Alternative Row)	16kg of local Old Man, Wavy and River Saltbush	

Table 2: Section 2 Site Design & Establishment Summary
(Perennial pastures, 20.8ha)

	Species Selection	**Establishment Design** ***To be established in August 2020***
Perennial Pastures	1. Sardi 7 Lucerne Seed (2kg/ha) – 50kg total (supplier quantity - rounded up) 2. Tall Wheat Grass Seed (5kg/ha) – 140kg (supplier quantity - rounded up) 3. Kikuyu Seed (0.25kg/ha) – 7kg total (supplier quantity - rounded up) 4. Dalkeith Sub Clover Seed (3kg/ha) – 75kg total (supplier quantity - rounded up) 5. Commander Chicory Seed (2kg/ha) – 50kg total (supplier quantity - rounded up) 6. Panic Seed (2kg/ha) - 50kg total (supplier quantity - rounded up)	Double knockdown of 20.8 hectares with glyphosate prior to establishment Pasture seed was mixed and sown using an air seeder

MONITORING

Permanent monitoring points were established at various locations based on salinity and soil type (Figure 4). Plants were counted in 2, 3m rows to determine compositions within that 3m row, which was then converted to plants per square meter. This will be repeated bi-annually to determine pasture persistence. The grasses that were counted do not include ryegrass as this was a volunteer species that had come up since establishment. A 10m by 6 alley section of saltbush is also being monitored. This allows for three alleys of both Anameka seedlings and direct seed saltbush to be monitored for emergence and persistence at each of the three selected locations. Some areas are heavily overgrown with ryegrass and have struggled, *see Tables 3 and 4.*

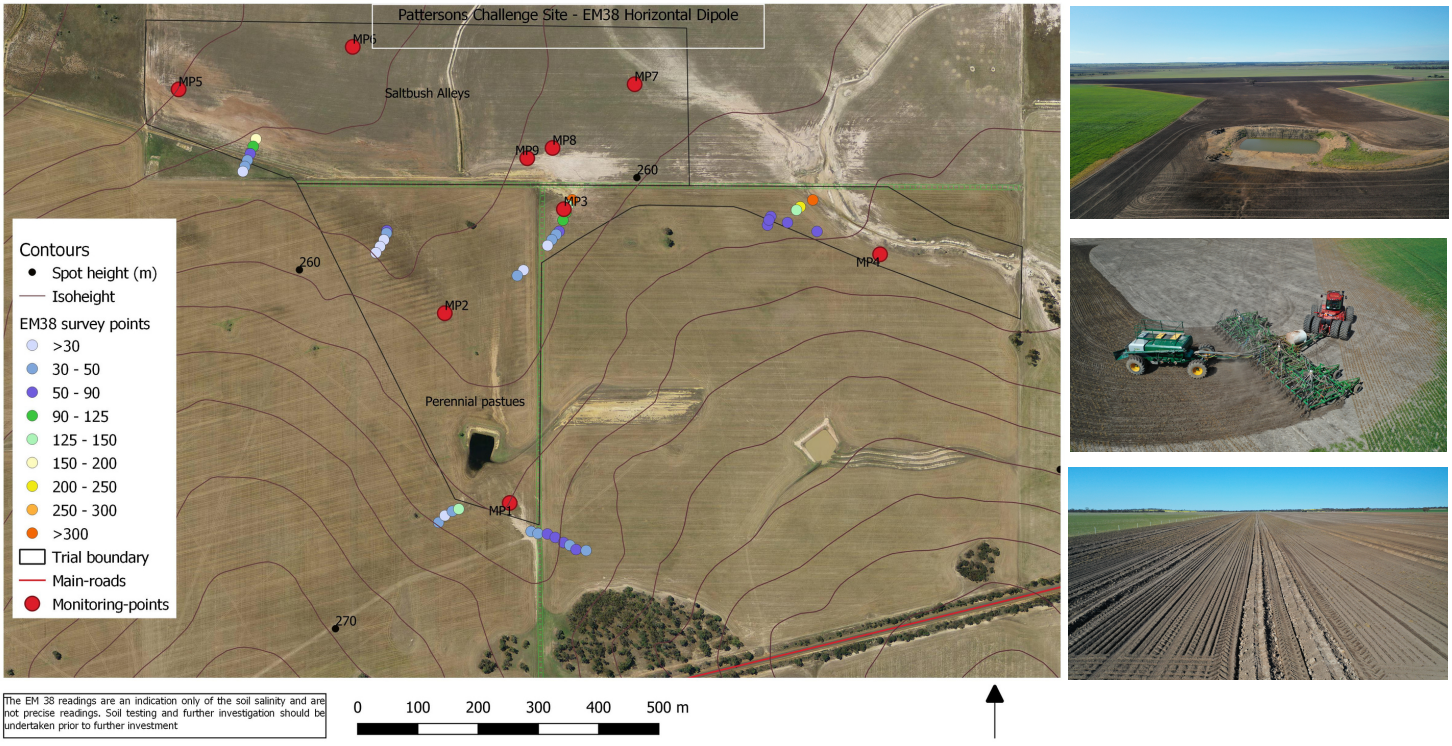


Figure 4: Monitoring Point Localtions

Table 3: Perennial Pasture Understory Seedling Emergence & Persistance

		Row 1			Row 2							
Peg	**Pasture mix**	**Grass**	**Legume**	**Herb**	**Grass**	**Legume**	**Herb**		**Total**	**Grass per m2**	**Legume per m2**	**Herb per m2**
1	Perennial only	79	12	16	45	13	12	**90% TWG (Tall Wheat Grass)**	177	119.54	23.71	26.81
2	Perennial only	67	20	14	61	18	19	**90% TWG 20% of Legume Lucerne**	199	121.95	36.22	31.12
3	Perennial only	9			10			**All TWG**	19	18.01	0.00	0.00
4	Perennial only	48	15	12	56	7	6	**95% TWG**	144	98.45	21.31	17.41
5	Saltbush	36	5		26	11		**95% TWG**	78	59.42	14.91	0.00
6	Saltbush	4		10	3	12		**90% Messina, Dominant Ryegrass**	29	6.70	10.81	10.00
7	Saltbush	17	12		18	10		-	57	33.22	21.01	0.00
8	Saltbush	14	8		33	9		**-**	64	43.73	16.11	0.00

Table 4: Saltbush Seedling & Direct Seeded Establishment & Persistance

Peg	**Direct seeded**			**Seedling**	**Direct seeded**			**Seedling**	**Direct seeded**			**Seedling**
	Oldman	**River**	**Wavy**	**Anameka**	**Oldman**	**River**	**Wavy**	**Anameka**	**Oldman**	**River**	**Wavy**	**Anameka**
5	5			7	9			8	8			7
6	**4**			7	13			7	6			6
7	3			7	1			6	4			7
9				47								

LOOKING FORWARD

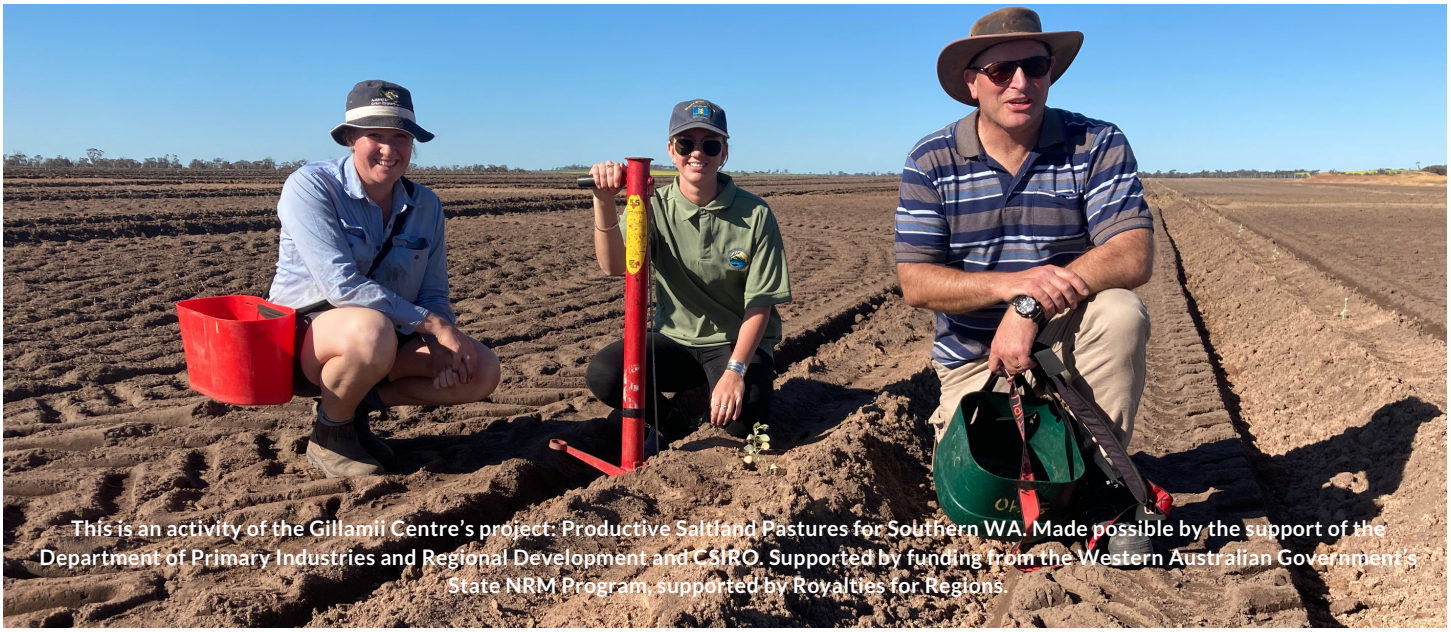
The site is showing promising results with Section 2 ready to be utilised throughout summer and autumn 2021 where there is often a feed-gap on farms. Section 1 will have to exclude stock for another year to allow the saltbush seedlings to establish.

It is hoped that the site will act as a demonstration for the Patterson family and wider community, to see what species have worked and what hasn't, along with further learnings surrounding the site design for sheep management and machinery access.

Currently, DPIRD and the Gillamii Centre are working on developing an App called Saltland Genie. The Web App is being designed to help landholders choose profitable options for managing saltland pastures on their property. The App will bring resources, decision making tools and on-farm research trials into one place to help users find the best management option for their salinity problem. There will be a range of interactive tools such as:

- Soil and water salinity unit converter and calculator
- Saltland economics calculator
- 'Solutions explorer' – an easy, intuitive way to learn about salinity, and discover recommended species, and management recommendations.

Saltland Genie will integrate with DPIRD's website which covers many salinity topics, including plant-based and engineering options, how salinisation occurs, and how to measure and monitor salinity. The App will be available mid 2021. For help and access to resources now, visit the Gillamii and DPIRDs websites on the following links:
www.agric.wa.gov.au/salinity
www.gillamii.org.au



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