2008

Pastoral profits guide, a paddock guide to achieving sustainable livestock productivity

Mark Alchin

Jim Addison

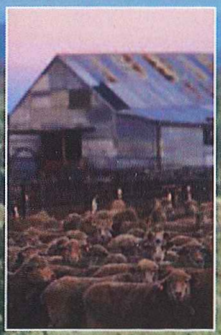
Valarie Shrubb

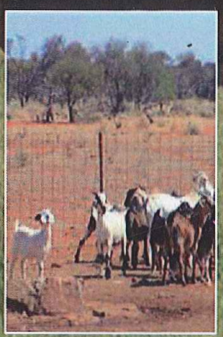
Zac Cockerill

Matthew Young

See next page for additional authors

Authors
Mark Alchin, Jim Addison, Valarie Shrubb, Zac Cockerill, Matthew Young, Tim Johnson, and Greg Brenan





PASTORAL PROFITS GUIDE

A paddock guide to achieving sustainable livestock productivity

Department of Agriculture and Food
Government of Western Australia

Australian Government
Department of Agriculture, Fisheries and Forestry
National Landcare Programme

This Pastoral Profits Guide was compiled by Mark Alchin, Jim Addison, Valerie Shrubb, Zac Cockerill, Matthew Young, Tim Johnson and Greg Brennan.

DISCLAIMER

The Chief Executive Officer of the Department of Agriculture and Food and the state of Western Australia accept no liability whatsoever by reason of negligence or otherwise arising from use or release of this information or any part of it.

TABLE OF CONTENTS

ACKNOWLEDGMENTS

This guide was prepared as a part of the 'Sustainable and Profitable Pastoral Management in Western Australia's Southern Rangelands' project funded by the National Landcare Program, and the 'Sustainable Livestock Productivity' project funded by the Department of Agriculture and Food, Western Australia (DAFWA).

The authors would like to thank those people who provided valuable feedback in the preparation of this guide including Ken Shaw (Cunyu Station), Robert and Kathryn Mitchell (Barnong Station), David Wilcox (retired adviser) and Rosemary Bartle (Rural Business Solutions).

We are also grateful to the authors and publishers of the *Arid Shrubland Plants of Western Australia* for permission to reproduce some photographs of key plant species.

PREAMBLE

Most pastoralists appreciate the need to deliver an economic, environmental and social 'profit' from their business. Achieving these profits can be a real challenge given the comparatively low productive potential and the substantial seasonal variation in the WA Southern Rangelands region.

This guide was written to assist pastoralists to meet their specific livestock production, financial and range condition objectives through the better alignment of feed demand (stocking rate) to feed supply (carrying capacity).

We provide nine basic steps that simplify the process of managing the feed supply, equipping pastoralists with the tools to make decisions and to critically assess the outcomes.

The first part of the guide details the nine steps and worksheets that are used to make the assessment and assist in making a stocking decision. The second part provides reference material.

Definitions

Dry Sheep Equivalent (DSE) = feed demand for sheep and goats. A DSE is the amount of feed required for a maintenance diet of a 45 kg wether (approximately 2.5 kg of fresh feed per day).

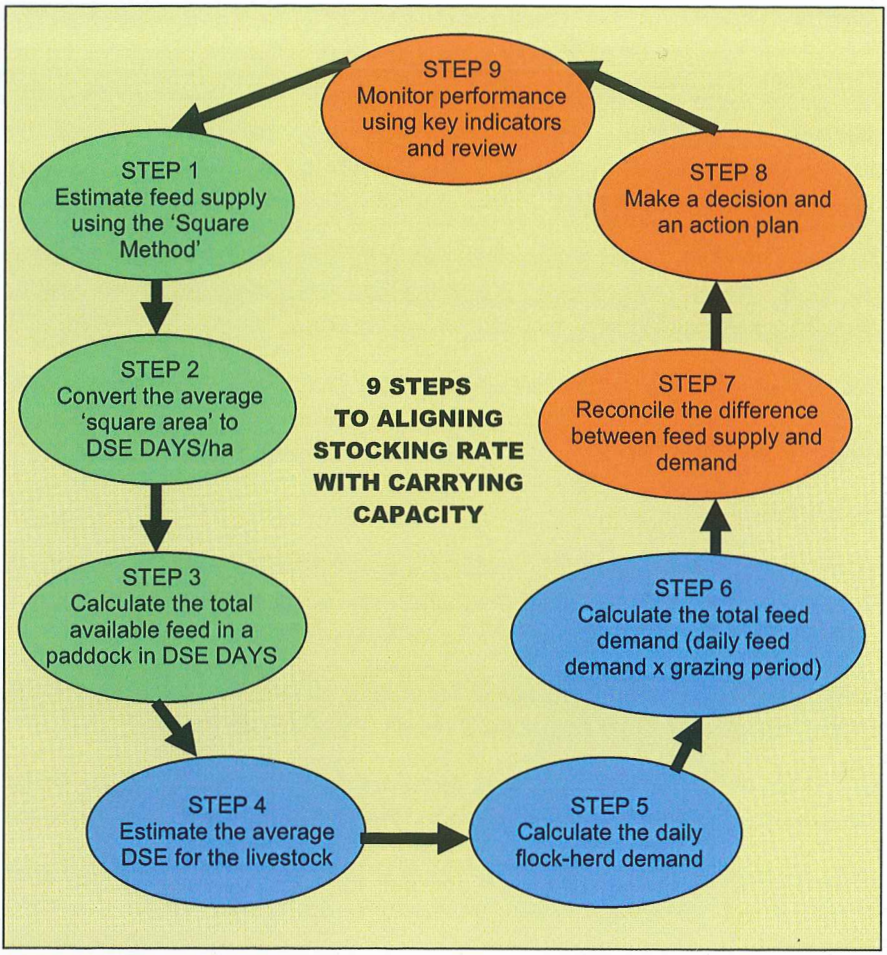
Cattle unit (CU) = feed demand for cattle. It is seven times a DSE (approximately 17.5 kg required to feed one CU per day).

DSE DAY = the amount of feed required to feed one DSE (a 45 kg wether) at maintenance for one day. The same applies for a CU day.

Some accuracy in calculation of feed supply and demand has been sacrificed for simplicity. The following chart summarises the nine basic steps for aligning stocking rate to seasonal carrying capacity. The process is divided into three main sections:

- estimating feed supply
- estimating feed demand
- reconciliation, action and monitoring plan.

The coloured bubbles in the chart show the steps involved in each Section. Green relates to the estimation of feed supply. Blue relates to the calculation of feed demand. Orange relates to the steps in making management decisions and the review process.



After going through the first six STEPS you will have the information required to complete the feed supply–demand reconciler. A truncated version of the reconciler (below) shows where all the information you collect as you work your way through the guide will end up. The reconciler is a tool which compiles your paddock and feed demand estimates and assists you in the process of making decisions.

Feed supply–demand reconciler

Name of paddock or water point	(A) Feed supply (DSE DAYS)	(B) Feed demand (DSE DAYS)	(C) Feed supply–demand Balance (A – B)	(D) Rangeland condition target (maintain or improve)	(E) Action strategy required to achieve objectives
5 Mile	42 000	71 920	-29 920	Improve	Sell steers, cull
Roscos	78 000	74 500	3 500	Maintain	Sell steers
Thompson	64 000	66 750	-2 750	Improve	Move
Flints	70 000	65 050	4 950	Improve	Maintain numbers
Whole property	254 000	278 220	-24 220		

Now that you know what you are aiming for as you work through the guide, let's begin.

SECTION 1—FEED SUPPLY

Animals need energy and protein to grow. During periods of active growth, green grasses and forbs provide sufficient energy and protein to sustain animal production. However, after 'haying off', protein increasingly has to be obtained from perennial shrubs. In areas dominated by perennial grasses (particularly Buffel), shrubs can be heavily utilised because there is an abundance of energy in the dry grass and the shrubs provide protein. Hence protein can be the limiting nutrient. In shrubland-dominated areas the situation can be reversed. The absence of grasses means that the limiting nutrient is energy. To achieve your business objectives it is important that you are able to accurately assess feed supply and provide an adequate balanced diet for your livestock throughout the production year.

Factors that influence feed production from native pastures include land type, seasonal conditions, rangeland condition, plant indicator species and available grazing area.

Land type. The Southern Rangelands is a mosaic of land types with pastoral potentials that vary considerably. The three broad land types are the mulga shrublands, saltbush-bluebush pastures and sandplains. The geology, soil, vegetation, slope and position in the landscape of the three land types are described in more detail in Appendix A. These characteristics determine the inherent production capacities of the pasture.

Seasonal conditions. Effective rainfall creating soil moisture for plant growth drives feed production. For most of the Southern Rangelands the winter growing season (May–October) produces the bulk of the feed which drives animal production. The winter and summer growing seasons are far from reliable. In most cases you are more likely *not* to get rainfall during the growing season than you are to receive it. For example, in Meekatharra there is only a 30–40 per cent chance that you will get a winter break of 25 mm between May and July. However, above-average seasons produce large amounts of feed that is rarely fully utilised. Proactive budgeting of feed supply and adjustment of stock numbers is required to manage these wide fluctuations in the growing seasons and their impact on animal productivity. See Appendix D for further information.

Rangeland condition. During dry times and summer, animal productivity is largely maintained through the use of the perennial 'haystack'. The 'haystack' generally includes grasses (for example, soft wanderrie and buffel), palatable sub-shrubs (saltbush, ruby saltbush) and palatable top-feed (mulga). If overgrazed, rangeland condition will decline, the 'haystack' will be reduced and a business will be more susceptible to the onset of dry periods. Once rangeland condition has declined, livestock productivity will be adversely affected and difficult to restore. Understanding the condition of a paddock will help you to know what sort of improvements in the vegetation and related increase in animal production you can expect to achieve.

Plant indicator species. These are plant species whose density, distribution and level of utilisation provide a good indication of vegetation condition and the pastoral potential of a paddock. See Appendix B.

Grazing area. The area available for grazing by livestock around a water point will vary throughout the year. Poor quality (saline) water and saline chenopod shrubland feed may have the effect of reducing the grazing radius for sheep and goats from 5 to 3.5 km and for cattle from 7 to 5 km—effectively doubling the stocking rate. Additional factors influencing the area grazed by livestock around a water point are identified in Appendix C.

The 'when, where and how' of estimating feed supply

To profit from your investment it is critical that you estimate feed supply on your property. The following section explains when, where and how to make this estimate.

When. Estimates should be made at the start and end of your main growing season. The terms *key* and *critical* dates are used to explain these two specific times. Your key date is defined as when there is a greater than 70 per cent chance that the growing season should have started. Beyond this date, if you have not received rain, adequate feed is unlikely to be produced during that particular growing season. For example, if no rain has fallen by 15 June then a good winter growing season is unlikely to eventuate. After your critical date at the end of the growing season, you are unlikely to

receive any more 'feed-producing' rain. These two dates are determined by using long-term rainfall records. Estimates should also coincide with periods when you have the opportunity to actually adjust stock numbers (mustering or shearing). Rainfall outside the 'growing season window' can occur and additional estimates may be made to determine whether it justifies an adjustment in stocking rate.

When determining where to make your estimates consider:

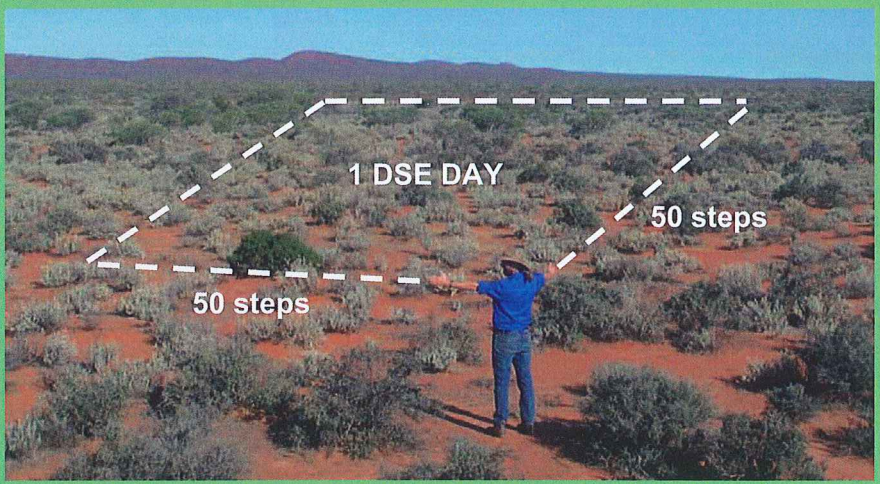
- Grazing radius. For small stock during the summer, do not include feed which is beyond 3 km from a watering point; for cattle do not include feed beyond 5 km. However, during an effective winter, surface water may be present and utilisation of the whole paddock may be possible.
- Do not assess feed in land types where you know stock are unlikely to graze as this may raise the stocking rate on the preferred land types.
- For access reasons, estimates are usually made at regular intervals along station tracks at increasing distances from water. Estimates are generally taken every time a substantial change in the available feed between sites is suspected.
- Permanent pasture monitoring sites (see Appendix E) can be used as a location to make an estimate of the feed supply. The benefit of this is that you can detect trends over time, both in terms of range condition and feed supply at a fixed point.

2.5 kg fresh weight of ruby saltbush (1 DSE DAY)—roughly equivalent to a full 10 L bucket)

How to make an estimate

- Use the 'square method'—a simple method designed to estimate feed supply on a regular basis.
- At each assessment site, identify each plant species that the livestock are likely to graze (use Appendix B as a guide).
- Imagine you have a 45 kg wether (1 DSE) and you have to fence off an area which has enough feed in it for one day so the animal will maintain its bodyweight (1 DSE DAY). To do this you will need an area which can provide 2.5 kg fresh weight of feed (this assumes that the fresh feed is 50 per cent moisture). For cattle, multiply this value by seven (1 CU will require 17.5 kg fresh weight of feed per day).
- To estimate the size of the area, remember that you only want to utilise 30 per cent of the perennial vegetation. More than this will increase the risk of losing individual shrubs and grasses (use Appendix F as a guide). If annual vegetation is present, 80 per cent utilisation of the annual feed is acceptable.
- Be aware that water quality may affect the utilisation of shrubs with high salt concentrations (800 mS/m or 4400 ppm for breeders and young stock is the level beyond which production losses are expected).

- Step out two sides of a square (in metres) which will be required to feed one DSE for one day as shown in the diagram below (for example, 50 m x 50 m). When learning it is better to overestimate than underestimate. Record this value.
- If your steps are not close to a metre, you may need to roughly calibrate your steps into metres and then use this so your values are all recorded in metres not steps.
- Complete as many estimates as necessary in the range of land types that you consider livestock are likely to graze so that you get an accurate representation of the feed supply present in the paddock. A minimum of 10 is recommended. Record these values.



Example of estimating feed supply for sheep using the square method. Multiply the area by seven for a Cattle Unit.

STEP 1—Estimate feed supply using the square method

With the background information described in the previous section, you are now ready to make your paddock estimates. Record your estimates in a worksheet as illustrated in Table 2.1. (A blank worksheet is provided in Appendix K.)

STEP 2—Convert the average area to DSE DAYS per hectare

Once you have made your estimates in the paddock in STEP 1, calculate the average amount of available feed you have per hectare in the paddock. This will be expressed in the units of DSE DAYS PER HECTARE (DDH). The carrying capacity log sheet (Table 2.1) will help you to do this. To convert your square method estimates into DDH, locate your side length in the feed estimate convertor (Table 2.2) and find the corresponding value. An example is given in Table 2.1.

Table 2.1 Carrying capacity log sheet

Feed estimate number	Land type (record the land type the estimate was made in)	Square side length (insert your estimates resulting from STEP 1 in this column)	DDH (calculated using Table 2.2. Values are shaded as an example)	Cumulative DDH tally (add DDH estimates 1 to 10)
1	Mulga	34	8.7	8.7
2	Mulga	47	4.5	13.2
3	Mulga	41	5.9	19.1
4	Mulga	52	3.7	22.8
5	Mulga	38	6.9	29.7
6	Saltbush	32	9.8	39.5
7	Saltbush	29	11.9	51.4
8	Saltbush	36	7.7	59.1
9	Sandplain	50	4.0	63.1
10	Sandplain	58	3.0	66.1
DDH TOTAL				66.1
Average DDH for paddock (DDH TOTAL divided by the number of feed estimates)				**6.61** (= 66.1 ÷ 10)

Table 2.2 Feed estimate convertor

Square side length (m)	DSE DAYS per ha (DDH)
200	0.3
180	0.3
160	0.4
140	0.5
120	0.7
110	0.8
100	1.0
95	1.1
90	1.2
85	1.4
80	1.6
75	1.8
70	2.0
65	2.4
60	2.8
59	2.9
58	3.0
57	3.1
56	3.2
55	3.3
54	3.4
53	3.6
52	3.7
51	3.8
50	4.0
49	4.2
48	4.3
47	4.5
46	4.7
45	4.9
44	5.2
43	5.4
42	5.7
41	5.9

Square side length (m)	DSE DAYS per ha (DDH)
40	6.3
39	6.6
38	6.9
37	7.3
36	7.7
35	8.2
34	8.7
33	9.2
32	9.8
31	10.4
30	11.1
29	11.9
28	12.8
27	13.7
26	14.8
25	16.0
24	17.4
23	18.9
22	20.7
21	22.7
20	25.0
19	27.7
18	30.9
17	34.6
16	39.1
15	44.4
14	51.0
13	59.2
12	69.4
11	82.6
10	100.0
9	123.5
8	156.3
7	204.1

STEP 3—Calculate the total available feed in a paddock in DSE DAYS

From STEP 2 you now know the average DDH of your paddock. Multiply this value by the size of the paddock to calculate the paddock's total carrying capacity. Use the carrying capacity calculator (Table 3.1). Take the average DDH value for your paddock from STEP 2 and match it with the approximate area of the paddock (round the average DDH to the closest value). This will give you a number which is the estimated carrying capacity of the paddock expressed in (DSE DAYS).

The numbers in the body of the table are multiplied by 1000. Using the earlier example from STEP 2, the average DDH was 6.61. Looking across from the 7000-ha paddock we can see that this results in a carrying capacity of 42 000 DSE DAYS.

Table 3.1 Carrying capacity calculator

Paddock area (ha)	Average DSE DAYS per hectare (DDH) (from Table 2.1)										
	1	2	3	4	6	10	15	20	30	40	50
1 000	1	2	3	4	6	10	15	20	30	40	50
2 000	2	4	6	8	12	20	30	40	60	80	100
3 000	3	6	9	12	18	30	45	60	90	120	150
4 000	4	8	12	16	24	40	60	80	120	160	200
5 000	5	10	15	20	30	50	75	100	150	200	250
6 000	6	12	18	24	36	60	90	120	180	240	300
7 000	7	14	21	28	42	70	105	140	210	280	350
8 000	8	16	24	32	48	80	120	160	240	320	400
9 000	9	18	27	36	56	90	135	180	270	36	450
10 000	10	20	30	40	60	100	150	200	300	400	500

Table 3.1 Carrying capacity calculator ... *continued*

Paddock area (ha)	Average DSE DAYS per hectare (DDH) (from Table 2.1)									
	60	70	80	90	100	120	140	160	180	200
1 000	60	70	80	90	100	120	140	160	180	200
2 000	120	140	160	180	200	240	280	320	360	400
3 000	180	210	240	270	300	360	420	480	540	600
4 000	240	280	320	360	400	480	560	640	720	800
5 000	300	350	400	450	500	600	700	800	900	1000
6 000	360	420	480	540	600	720	840	960	1080	1200
7 000	420	490	560	630	700	840	980	1120	1260	1400
8 000	480	560	640	720	800	960	1120	1280	1440	1600
9 000	540	630	720	810	900	1080	1260	1440	1620	1800
10 000	600	700	800	900	1000	1200	1400	1600	1800	2000

SECTION 2—Feed demand

After completing STEPS 1 to 3 in Section 1 you will have completed a 'stocktake' of your feed supplies and have an estimate of carrying capacity in your paddocks. The next step is to calculate your feed demand (stocking rate).

Feed demand is a product of the daily grazing intensity by livestock and other animals and time (days). It is not static. Feed demand of animals varies with liveweight, weight gain, metabolism and pregnancy and lactation status. Calculation of feed demand will enable you to achieve your objectives. This section takes you through STEPS 4 to 6 of the process that will help you to calculate your feed demand.

STEP 4—Estimate the average DSE for the livestock

Remember that a DSE is a standard unit used to compare different classes of stock and a CU is equivalent to 7 DSE. The DSE is based on the energy requirement of a 45 kg wether at maintenance. Animals requiring more feed have a higher rating and animals requiring less feed have a lower rating. To estimate the average DSE for the livestock we have to know the approximate liveweight of the animals in the paddock as well as their demands in relation to the production cycle (pregnancy, lactation etc.). This can be difficult, particularly when there may be mixed lines or if the rams or bulls are present all year round and there is no defined lambing or calving period. Considering this, the following DSE and CU tables will help you to determine the average DSE or CU for your flock/herd. If you are unsure about which value to use, it is always better to overestimate slightly.

As an example, to find the average DSE for a flock of breeding ewes with an average liveweight of 45 kg, go to 'DSE table: sheep breeders (adult)' and locate the value as shown on page 15. Similarly, for cattle, for breeders with an average weight of 400 kg the average value would be 7.5 DSE as shown on page 16. Record your value as it will be used in STEP 5.

DSE table: sheep breeders (adult)

Liveweight	Dry	Pregnant		Lactating	
		Single	Twins	Single	Twins
35	0.8	1.0	1.2	-	-
40	0.9	1.1	1.3	2.1	2.9
45	0.9	1.2	1.4	2.3	3.2
50	1.0	1.3	1.5	2.5	3.4
55	1.1	1.4	1.5	2.7	3.7
60	1.2	1.4	1.6	2.9	4.1
65	1.2	1.5	1.7	3.1	4.3

DSE table: sheep weaners

Liveweight (kg)	Post weaning growth rate (g/day)			
	0	50	100	150
15	0.4	0.5	0.6	0.8
20	0.5	0.6	0.8	1.0
25	0.6	0.7	0.9	1.1
30	0.6	0.9	1.1	1.3
35	0.7	0.9	1.2	1.4
40	0.8	1.0	1.3	1.5

DSE table: goats*

Nanny-dry	Nanny-wet (single)	Nanny-wet (twins)	Billy
1.2	1.5	1.9	1.6

* limited DSE data exists for goats

DSE-CU table: breeding cattle

Liveweight (kg)	Dry cows		Pregnant cows		Lactating cows	
	DSE	CU	DSE	CU	DSE	CU
350	5.8	0.9	5.8	0.8	12.0	1.7
400	6.4	0.9	7.5	1.1	13.4	1.9
450	6.9	1.0	8.2	1.2	14.8	2.1
500	7.1	1.0	8.4	1.2	15.2	2.2
550	7.7	1.1	9.0	1.3	16.5	2.4
600	8.4	1.2	9.7	1.4	17.8	2.6

DSE-CU table: feeder cattle

Liveweight (kg)	Steer/replacement heifer growth rate (kg/day)					
	0		0.5		1.0	
	DSE	CU	DSE	CU	DSE	CU
200	3.3	0.5	5.3	0.8	6.8	1.0
250	4.7	0.7	6.4	0.9	8.1	1.2
300	5.4	0.8	7.3	1.1	9.2	1.3
350	6.1	0.9	8.4	1.2	10.7	1.6
400	6.7	1.0	9.1	1.3	11.4	1.7
450	7.3	1.1	9.7	1.4	12.1	1.8
500	7.7	1.1	10.3	1.5	12.7	1.8

STEP 5—Calculate the daily flock/herd demand

We now know the average DSE or CU for the flock/herd. The next step is to multiply this value by the total number of livestock we have in the paddock. This value tells us how much feed is required each day to achieve our objectives. To do this, use Table 5.1 for sheep and goats or Table 5.2 for cattle.

For example, if you wish to run 300 breeding ewes in your paddock that have an average DSE of 1.2 (as we worked out from STEP 4) then by using Table 5.1 you can see that each day you will require the equivalent of 375 DSE DAYS in feed to achieve your objectives.

Similarly for cattle, if you had 55 breeders in your paddock with an average DSE of 7.5 (as we worked out from STEP 4), Table 5.2 shows that you will require the equivalent of approximately 440 DSE DAYS in feed to achieve your objectives. When your value does not match exactly those given in the tables, it is better to overestimate than underestimate. Record your daily feed demand value as it will be used in STEP 6.

Table 5.1 Daily flock demand (DSE DAYS)

Flock size (head)	Average DSE								
	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
50	25	38	50	63	75	88	100	113	125
75	38	56	75	94	113	131	150	169	188
100	50	75	100	125	150	175	200	225	250
125	63	94	125	156	188	219	250	281	313
150	75	113	150	188	225	263	300	338	375
175	88	131	175	219	263	306	350	394	438
200	100	150	200	250	300	350	400	450	500
225	113	169	225	281	338	394	450	506	563
250	125	188	250	313	375	438	500	563	625
275	138	206	275	348	413	481	550	619	688
300	150	225	300	375	450	525	600	675	750
325	163	244	325	406	488	569	650	731	813
350	175	263	350	438	525	613	700	788	875
375	188	281	375	469	563	656	750	844	938
400	200	300	400	500	600	700	800	900	1000
425	213	319	425	531	638	744	850	956	1063
450	225	338	450	563	675	788	900	1013	1125
475	238	356	475	594	713	831	950	1069	1188
500	250	375	500	625	750	875	1000	1125	1250
550	275	413	550	688	825	963	1100	1238	1375
600	300	450	600	750	900	1050	1200	1350	1500
650	325	488	650	813	975	1138	1300	1463	1625
700	350	525	700	875	1050	1225	1400	1575	1750
750	375	563	750	938	1125	1313	1500	1688	1875

TABLE 5.2 Daily herd demand (DSE DAYS)

Herd size (head)	Average DSE								
	3	5	7	8	9	10	11	12	13
10	30	50	70	80	90	100	110	120	130
15	45	75	105	120	125	150	165	180	195
20	60	100	140	160	180	200	220	240	260
25	75	125	175	200	225	250	275	300	325
30	90	150	210	240	270	300	330	360	390
35	105	175	245	280	315	350	385	420	455
40	120	200	280	320	360	400	440	460	500
45	135	225	315	360	405	450	495	540	585
50	150	250	350	400	450	500	550	600	650
55	165	275	385	440	495	550	605	660	715
60	180	300	420	480	540	600	660	720	780
65	195	325	455	520	585	650	715	780	845
70	210	350	490	560	630	700	770	840	910
75	225	375	525	600	675	750	825	900	975
80	240	400	560	640	720	800	880	960	1040
85	255	425	595	680	765	850	935	1020	1105
90	270	450	630	720	810	900	990	1080	1170
95	285	475	665	760	855	950	1045	1140	1235
100	300	500	700	800	900	1000	1100	1200	1300

STEP 6—Calculate the total feed demand

The final STEP in calculating feed demand in your paddock is to factor in the other grazers (kangaroos, unmanaged goats, camels, donkeys, horses) and multiply these values by the length of time you intend to graze the paddock. To do this, use Table 6.1 to enter in your values and follow the basic maths to calculate your total feed demand for the paddock. In the absence of very accurate records, kangaroos and goats generally constitute 35 per cent and 20 per cent of the grazing pressure in a paddock, respectively. If horses, camels, donkeys or rabbits are present, include an estimate of their numbers (horses and camels have an average rating of 12.5 DSE; rabbits have an average rating of 0.1 DSE).

The length of the grazing period may simply be defined as the period when you are next likely to return to the paddock and adjust numbers such as at weaning, sales and shearing. In this example the estimates of feed were made in early June to coincide with the start of the winter growing season (key date) and the paddock will be grazed with 300 breeding ewes through until the end of the growing season in September (a total of four months), when any saleable stock or weaners will be offloaded.

Table 6.1 Total grazing pressure calculator

Paddock name	DSE demand per day				(E) Total DSE demand per day (A+B+C+D)	(F) Grazing period length (days)	Total demand (DSE DAYS) (E x F)
	(A) Daily flock/herd demand (enter the value from STEP 5)	(B) Kangaroos (estimated No. x 0.7 DSE)	(C) Unmanaged goats (estimated No. x 1.5 DSE)	(D) Other (horses, camels, rabbits) (estimated No. x DSE)			
5 Mile	375	92 (35% of 375 x 0.7)	113 (20% of 375 x 1.5)	nil	580	124 (4 months)	**71 920**

SECTION 3—Reconcile, take action and monitor

Sections 1 and 2 took you through the STEPS of estimating feed supply and demand in a paddock. Just as an accountant will reconcile your income with your expenses to ensure your business is on track, there needs to be a reconciliation of your feed supply and demand. The reconciliation will provide direction for potential strategies. This next section assists you to reconcile the difference in supply and demand and outlines the options that will help you to meet your stated objectives.

STEP 7—Reconcile the difference between feed supply and demand

Table 7.1 will help to determine whether your current management plan will effectively align feed supply and demand both in individual paddocks and across the whole station and ensure you achieve your stated objectives. To use the reconciler, enter the values you calculated in the previous STEPS as directed and complete the simple maths. A worked exampled based on the values from previous STEPS is provided.

STEP 8—Make a decision and take action

The reconciler worksheet includes two columns (Column D and E) which are designed to help you make decisions about stocking rate adjustments. The *Rangeland Condition Target* (Column D) is where you fill in your goal for each paddock. For the purposes of this exercise, you need only state whether you want the condition of a specific paddock to be either *maintained* or *improved.* To decide, ask yourself, 'Is this paddock in the condition I want it to be'—that is, is it as good as it can get? This decision is helped by looking at the density, distribution and diversity of your preferred perennial pasture plants (see Appendix B for help on which species you should be looking for).

Column E allows you to record your preferred strategy in response to the reconciliation balance (Column C). In our example we find that in 5 Mile paddock there is insufficient feed supplies (a deficit of 29 920 DSE DAYS) to meet our livestock objective for our current stocking rate plan. If we proceed with this plan we will not only fail to reach our livestock objective but we may fail to achieve our objective of improving the condition of the paddock. Hence, we will need to look at the options that will reduce grazing pressure. To do this, go to Appendix G, which details the recommended options for different circumstances.

Table 7.1 Feed supply-demand reconciler

Name of paddock or water point	**(A)** **Feed supply (DSE DAYS)** (enter the value from STEP 3)	**(B)** **Feed demand (DSE DAYS)** (enter the value from STEP 6)	**(C)** **Feed supply-demand Balance** (A – B)	**(D)** **Rangeland condition target** (maintain or improve?)	**(E)** **Action strategy required to achieve objectives**
5 Mile	42 000	71 920	–29 920	Improve	Sell and move
Roscos	78 000	74 500	3 500	Maintain	Maintain numbers
Thompson	64 000	66 750	–2 750	Improve	Move numbers
Flints	70 000	76 050	–6 050	Improve	Move numbers
Snake	38 000	26 100	11 900	Improve	Maintain numbers
Killers	52 000	49 100	2 900	Improve	Maintain numbers
Peters	56 000	42 250	13 750	Maintain	Maintain numbers
Lake	45 000	42 300	2 700	Maintain	Maintain numbers
Mumber	67 000	58 150	8 850	Improve	Maintain numbers
Whole property	512 000	507 120	4 880		

Once you have finished STEP 8 you will have a clear picture of how you can go about 'juggling the numbers' to align stocking rate with carrying capacity across the whole station and achieve your objectives. In some cases, you may find that some paddocks will be 'overstocked' (deficits) and others will be understocked ('surpluses') if you proceed with your current stocking plan. Hence, you may be able to move some stock around. At other times you may find you have deficits in every paddock, which will signal that you will need to take action, the severity of which will be determined by the size of the deficits. You may also find that in above-average seasons you have large surpluses. These surpluses could be used to support more stock and/or be 'banked' in the form of increasing your perennial 'haystack' and improve rangeland condition.

Once you have finalised your stocking strategy based on your reconciliation it is time for the final STEP, which is to monitor and review the result.

STEP 9—Monitor performance using key indicators and review

To ensure you achieve your objectives it is important to regularly monitor key indicators and review the outcomes. Feed supply and demand can change even after you have completed your estimates and you need to 'keep your finger on the pulse' and manage for it accordingly. There are a few simple indicators you can regularly monitor to assist you in your management:

- trend in body condition score (this is explained in Appendix H for sheep and goats, and in Appendix I for cattle)
- reproductive rates and/or liveweight gain
- utilisation of indicator plant species (Appendix F)
- monitoring rangeland condition using pasture monitoring sites (Appendix E).

Livestock are often the best 'calibrator' for your feed estimates and their performance (as assessed by body condition score) will quickly tell you if you have perhaps been 'too generous' or too 'conservative'

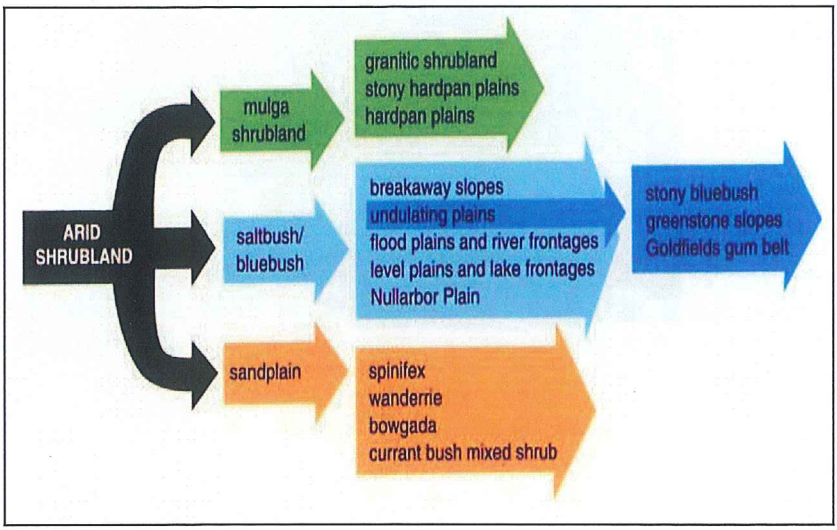
in your estimates. Hence, monitoring body condition score (along with the other indicators over time) will 'fast-track' your capacity to align stocking rate according to seasonal carrying capacity.

Well done! You have now completed the 9 STEPS involved in achieving sustainable livestock productivity in the WA Southern Rangelands. The second part of this guide provides more detailed reference material that will help you to sharpen your skills. Like most things in life, practice makes perfect, and the more regularly you follow this 9-STEP process the more competent you will become and the better equipped you will be to take your business to a new level of management.

APPENDICES: ADDITIONAL REFERENCE MATERIAL

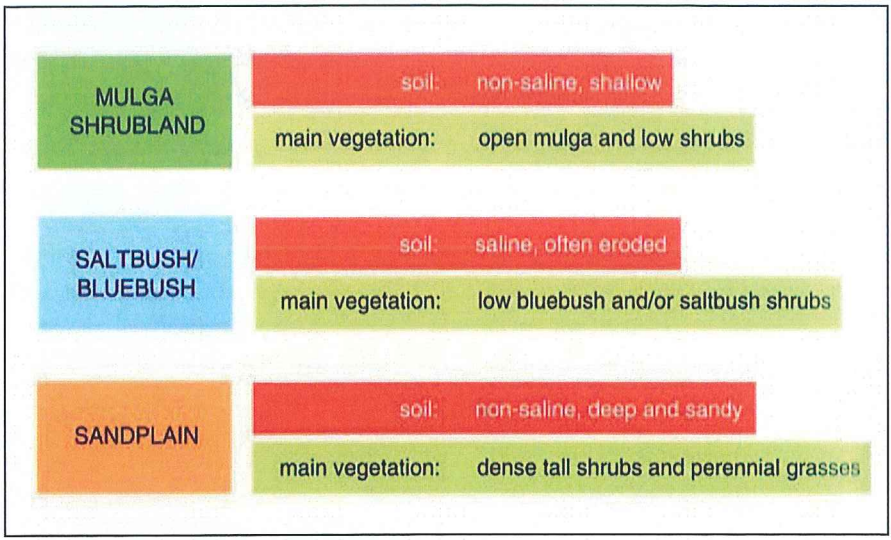
APPENDIX A Main rangeland types

The WA Southern Rangelands is a mosaic of land types which have vastly different productive potentials and which can respond differently to both grazing and seasonal rainfall (summer *vs.* winter). Knowing the land type and its potential is important for you to design your management system. The main land types and their various different land systems are outlined in the following diagram.



Burnside, et al. 1995, 'Reading the Rangeland'

These land types are defined by various soil and vegetation characteristics summarised in the diagram on page 24. In general, saltbush-bluebush pasture is the most productive land type. When in good condition it can provide an ample supply of both annual and perennial feed. Saltbush-bluebush pastures are also fairly resilient and can recover over time from overgrazing. Mulga shrublands are the dominant land type on most stations and when in fair–good condition they can provide adequate forage for livestock production. Mulga shrublands are more susceptible to degradation and will not easily recover. Sandplains can provide adequate forage during average to above-average seasons. However, the quality of the feed tends to be fairly poor.



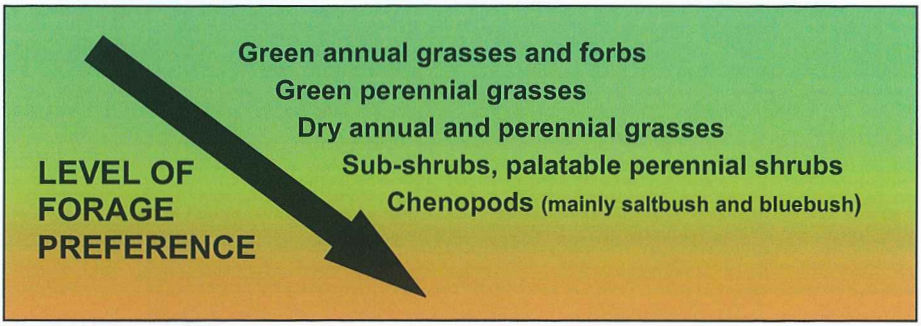
Burnside, et al. 1995, 'Reading the Rangeland'

For a comprehensive overview of the main land types in the WA Southern Rangelands and descriptions of land condition it is recommended that you obtain a copy of *Reading the Rangeland* (details at the end of this guide).

APPENDIX B Plant indicator species

A plant indicator species is a plant that either increases or decreases in its population density and distribution in response to grazing pressure. Like an index on the stock market, indicator species can act as a visual gauge for the quality and quantity of the feed supply. They can also assist us in assessing rangeland condition.

Grazing animals generally preferentially select pasture components in the following order:



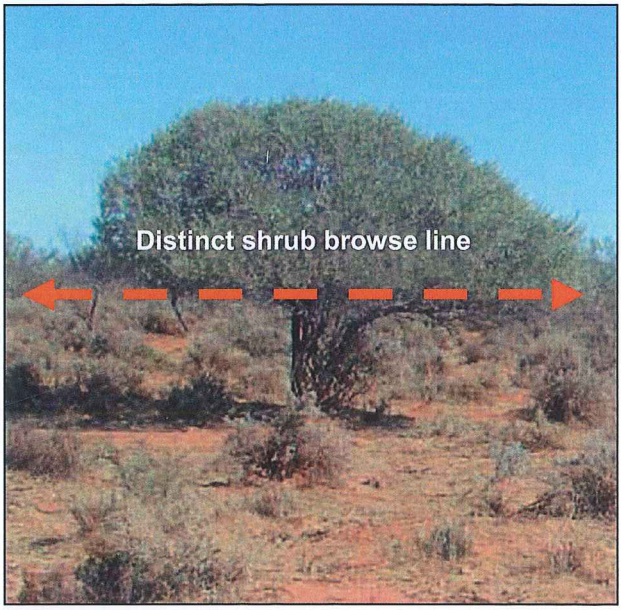
In broad terms there are two types of plant indicator species—decreaser plants and increaser plants.

Decreaser plants are those palatable, productive and perennial species that are targeted by stock. These plants (for example, soft wanderrie grass and ruby saltbush) typically decrease in size and number under heavy grazing. Increaser plants (for example, needlebush) are usually less palatable species that are generally unattractive to stock and consequently their density and distribution increase under heavy grazing.

A clear warning sign that indicates that feed supply has become chronic is the appearance of browse lines on shrubs that are of marginal feed quality. These shrubs can be referred to as 'canary' plants. The use of the term 'canary' plants comes from the time when canaries were used to warn coal miners of deadly levels of methane gas (low oxygen) within the mine shaft. In short, if the bird died, the miners should evacuate. Certain plant species can be used

in a similar sense. If grazing and browse lines begin to appear on these plants, then feed supply has reached critical levels and management should respond decisively to maintain livestock performance and rangeland condition. Remember that there is always a degree of variation in the palatability of different plant species in different areas. For example, species such as curara can be a highly preferable source of feed in some parts of the Gascoyne but are rarely utilised in the Murchison. This highlights the importance of continually monitoring your own vegetation (population density and distribution) and stock (body condition scores, weight gain and reproductive rates).

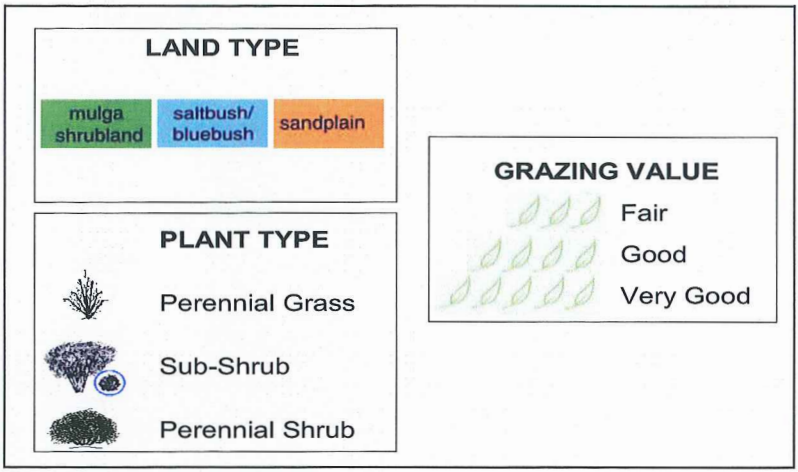
Effective management of grazing pressure provides opportunities for the regeneration of desirable decreaser species. This can result in the maintenance of an adequate feed supply and improvement in rangeland condition in a paddock.

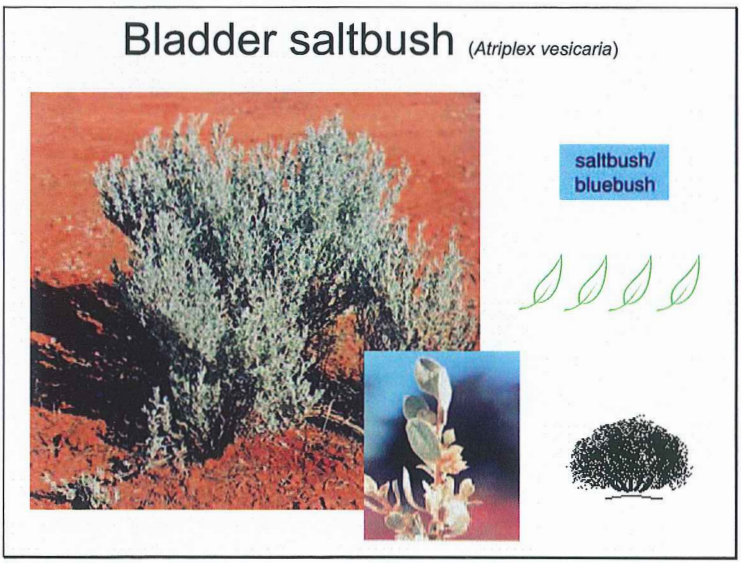


The following section provides a brief description of 25 important decreaser plant species found in the Southern Rangelands.

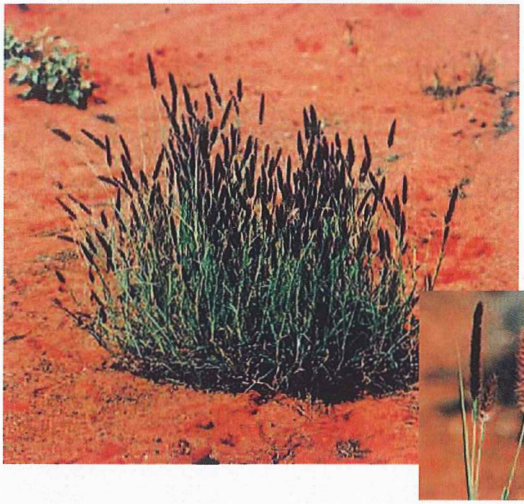
These are the plant species that in your management strategy you should be aiming to increase in your paddocks.

Each description includes an **image** of the plant, the **plant type** (perennial grass, sub-shrub, perennial shrub), the plant's preferred **land type** (mulga shrubland, saltbush-bluebush, sandplain) and the plant's appropriate **grazing value**, which takes into account the forage value of the plant, its stock palatability, preference and its potential as a decreaser species (grazing tolerance and drought tolerance).





Buffel grass (*Cenchrus ciliaris*)

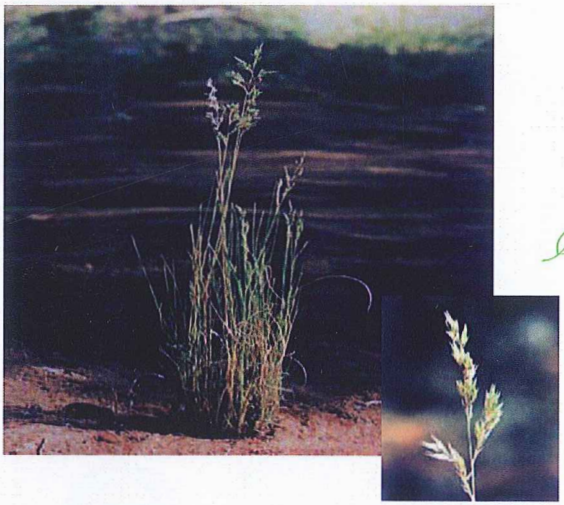


mulga shrubland

saltbush/ bluebush

sandplain

Claypan grass (*Eriachne flaccida*)



saltbush/ bluebush

sandplain

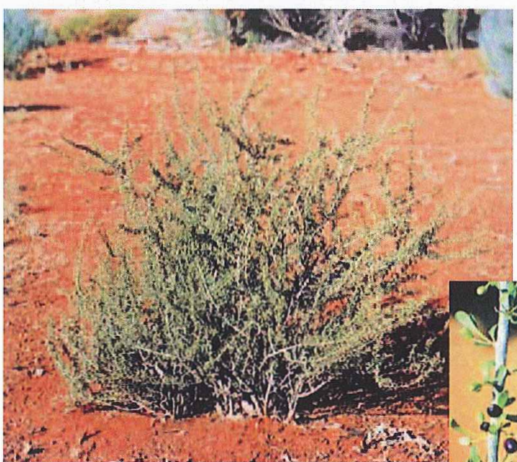
Cotton bush (*Ptilotus obovatus*)

mulga shrubland

saltbush/ bluebush

sandplain

Current bush (*Scaevola spinescens*)

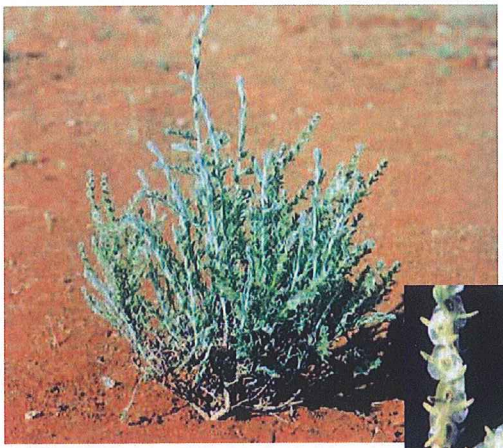


mulga shrubland

saltbush/ bluebush

sandplain

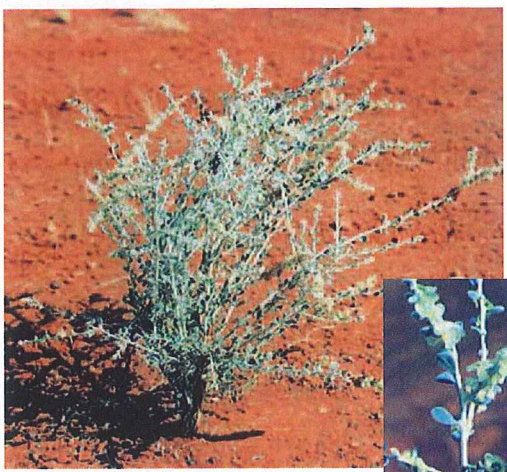
Felty bluebush (*Maireana tomentosa*)



mulga shrubland

saltbush/ bluebush

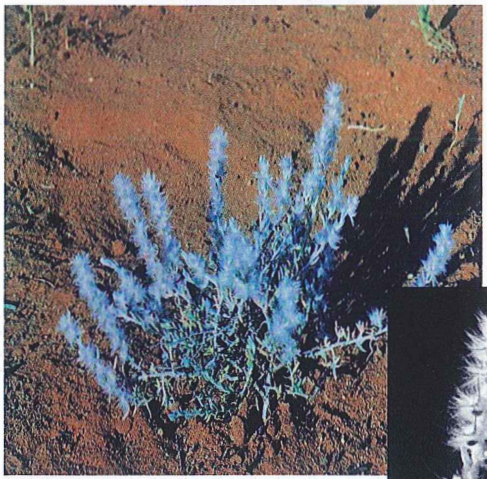
Flat-leaved bluebush (*Maireana planifolia*)



mulga shrubland

saltbush/ bluebush

Fluffy bindii (*Sclerolaena eurotioides*)



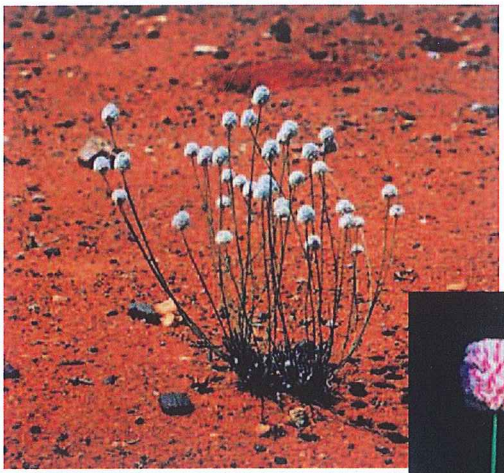
mulga shrubland

saltbush/ bluebush

Golden bluebush (*Maireana georgei*)

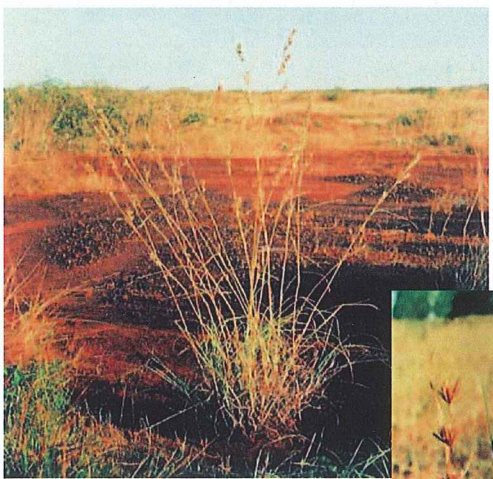
saltbush/ bluebush

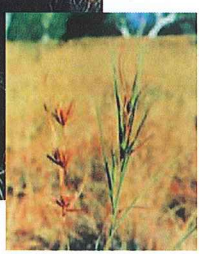
Horse mulla mulla (*Ptilotus schwartzii*)



mulga shrubland

Kangaroo grass (*Themeda triandra*)

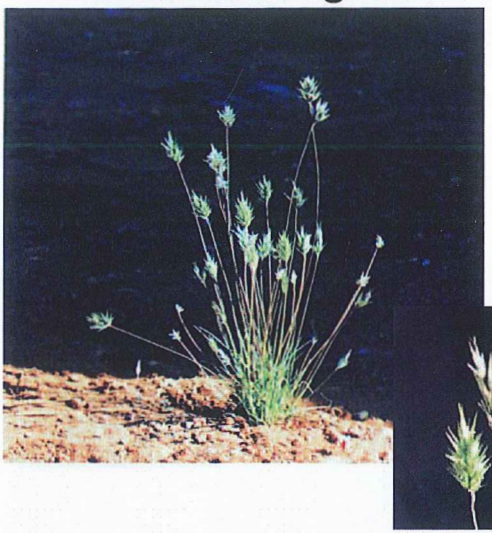




mulga shrubland

saltbush/ bluebush

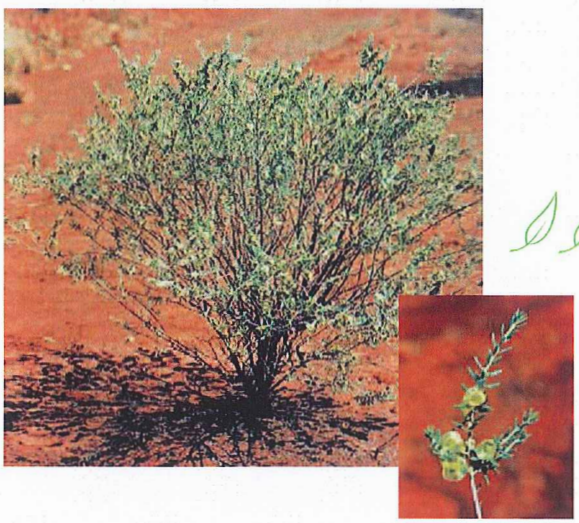
Limestone grass (*Enneapogon caerulescens*)



mulga shrubland

saltbush/ bluebush

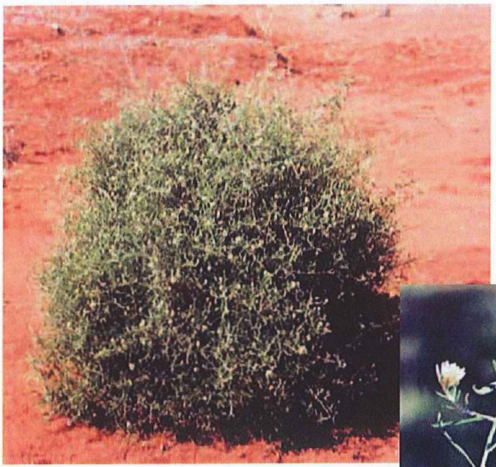
Mulga bluebush (*Maireana convexa*)



mulga shrubland

saltbush/ bluebush

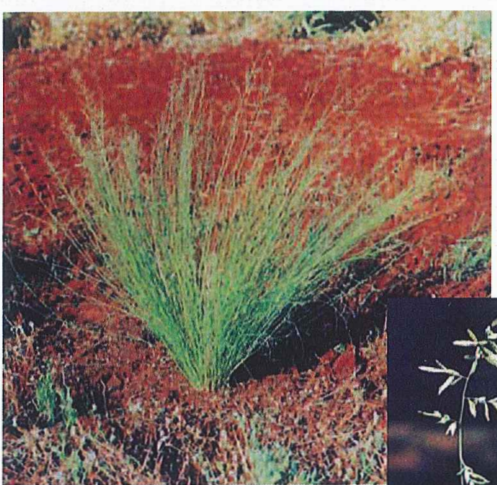
Narrow-leaved mulla mulla (*Ptilotus divaricatus*)



mulga shrubland

saltbush/ bluebush

Neverfail (*Eragrostis setifolia*)



mulga shrubland

saltbush/ bluebush

sandplain

Ribbon grass (*Chrysopogon fallax*)

mulga shrubland

saltbush/ bluebush

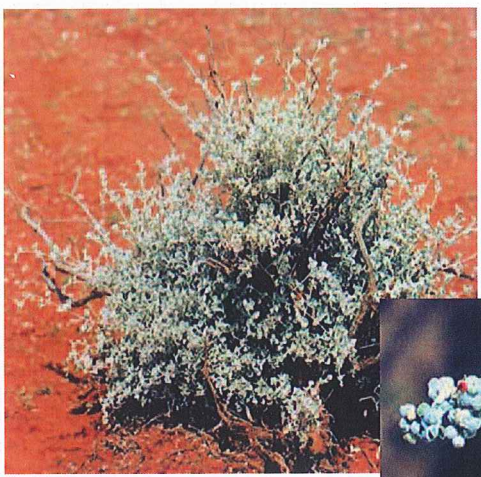
sandplain

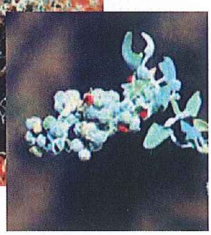
River/Swamp saltbush (*Atriplex amnicola*)

saltbush/ bluebush

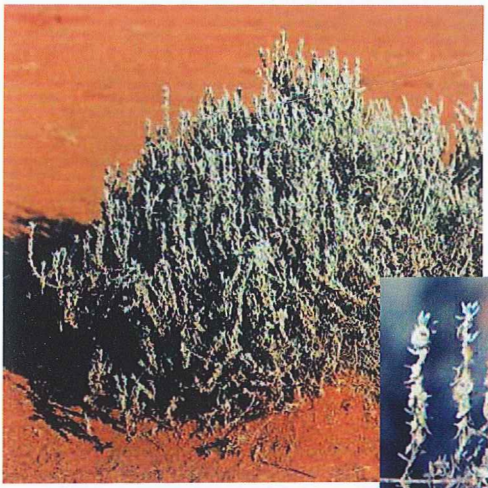
Ruby saltbush (*Enchylaena tomentosa*)

Scrambling saltbush (*Chenopodium gaudichaudianum*)





Shy bluebush (*Maireana platycarpa*)



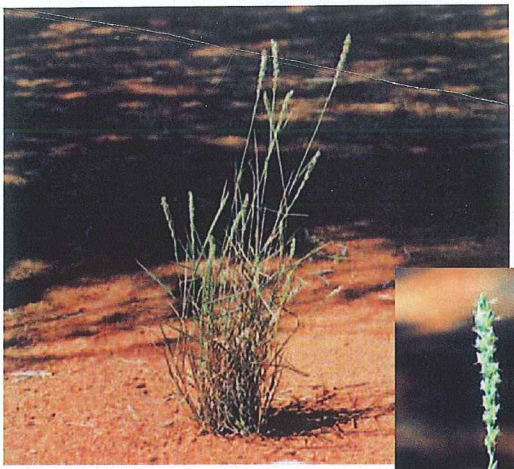
saltbush/
bluebush

Silver saltbush (*Atriplex bunburyana*)

mulga
shrubland

saltbush/
bluebush

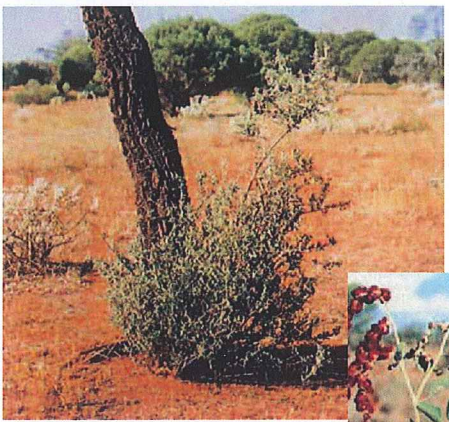
Soft wanderrie grass (*Thyridolepis multiculmis*)

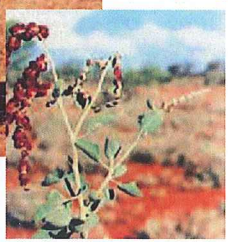


mulga shrubland

sandplain

Tall saltbush / Rhagodia (*Rhagodia eremaea*)



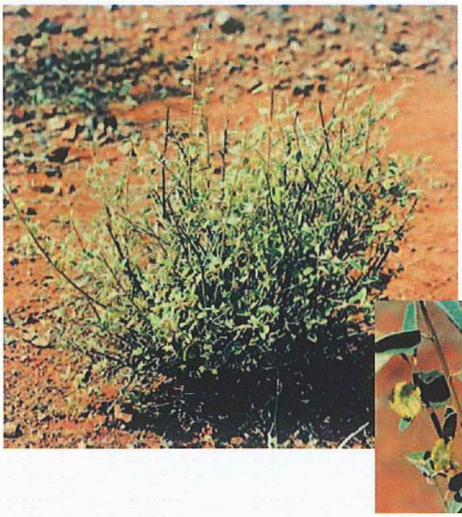


mulga shrubland

saltbush/ bluebush

sandplain

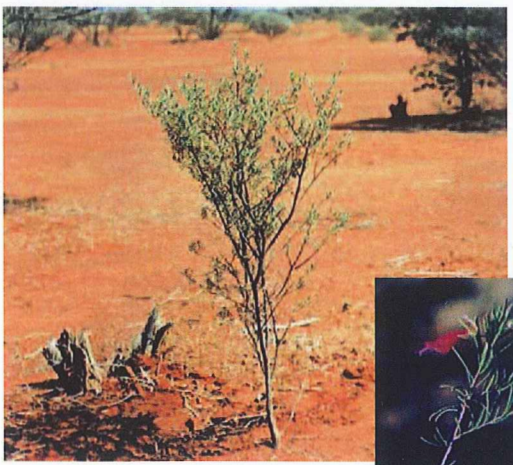
Tall sida (*Sida calyxhymenia*)



mulga shrubland

saltbush/ bluebush

Warty fuchsia bush (*Eremophila latrobei*)



mulga shrubland

saltbush/ bluebush

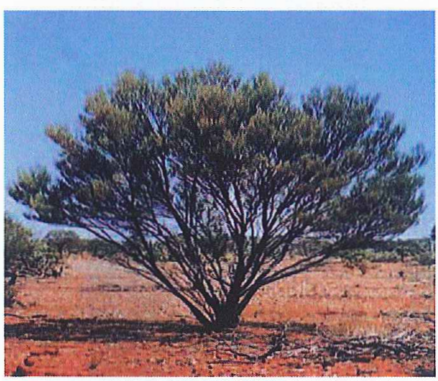
Canary species

The following pictures are of the main 'canary' plants to look out for in the Southern Rangelands. If browse lines are appearing on these shrubs then feed supplies have become very limited and action should have been taken earlier.

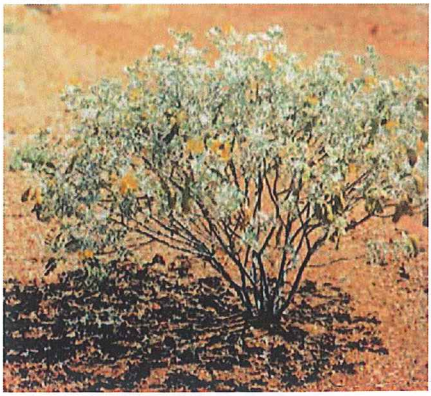
Bardi bush (prickly acacia)
(*Acacia victoriae*)

Limestone wattle
(*Acacia sclerosperma*)

Turpentine bush
(*Eremophila fraseri*)



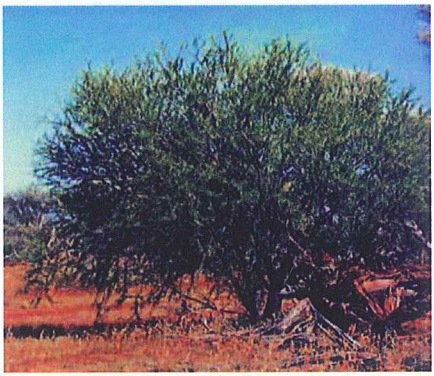
Mulga
(*Acacia aneura*)



Crinkled cassia
(*Cassia helmsii*)

Needlebush
(*Hakei preissii*)

Snakewood
(*Acacia xiphophylla*)



Curara
(*Acacia tetragonaphylla*)

Wanderrie wattle (witchetty bush)
(*Acacia kempeana*)

Wanyu (Bowgada)
(*Acacia linophylla*)

APPENDIX C Factors influencing the grazing area

The class of livestock and the water supply are the two main factors that influence the grazing radius out from a watering point. The grazing radius is important as it effectively determines how much feed is available. The recommended grazing radius for sheep and goats is 3 km and for cattle 5 km. Generally, if livestock are required to travel further than these distances then daily productivity gains can be compromised.

Class of stock

Sheep and goats versus cattle. Sheep and goats may be able to source most of their water requirement from green feed, while it is available. This allows them to remove most of the restriction that the watering point places upon them. Cattle, however, always require regular access to free water supplies and are therefore more 'tied' to the water point than sheep.

Breeds. Anecdotal experience indicates that *Bos indicus* cattle are able to graze out further than *Bos taurus* cattle. Likewise, Damara sheep and goats may be able to utilise much more of a paddock when compared to Merinos.

Reproduction and lactation. Milk production requires additional water to be consumed. For sheep, the requirement during lactation is double that of a comparable dry ewe. A lactating cow requires 50 per cent more water than for a comparable dry cow. Breeders with young at foot have their grazing area restricted. Cattle with calves at foot spend most of their grazing time in the summer within 3.5 km of the watering point.

Water supply

The following water supply characteristics will influence the area grazed, assuming water supply is not limiting.

Salinity. Sheep, goats and cattle markedly increase water consumption with increases in water salinity. Animals are more tolerant of salt in their feed than in their water. However, an increase

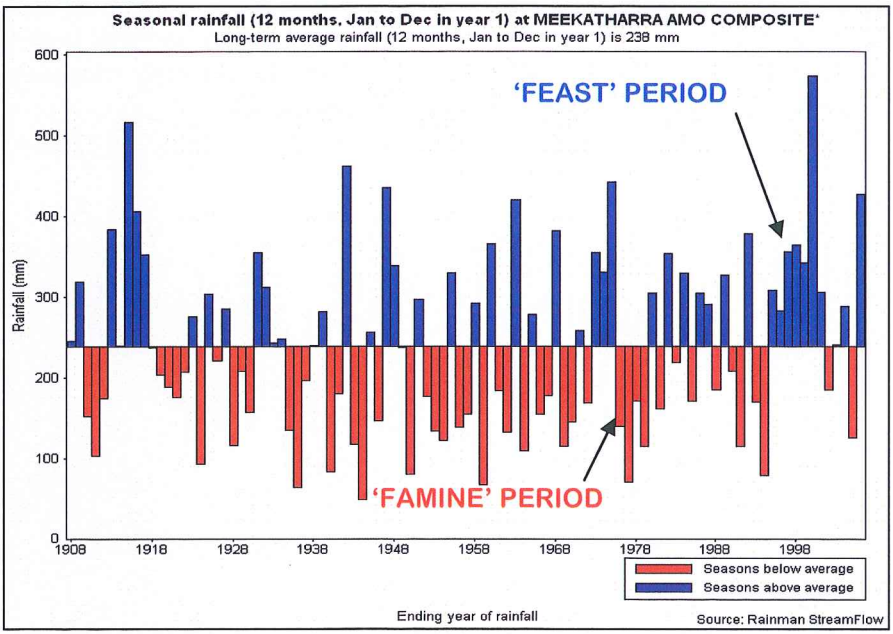
in salt consumption from either source will result in greater water consumption. Salt consumed in either feed or water must be excreted in the animal's urine. As salt ingestion increases so does the requirement for additional water to flush out surplus salt.

Air temperature. As temperatures increase so does water demand. A study in central Australia indicated that 90 per cent of cattle drank daily when maximum daily temperature exceeded 41 °C. Only 30 per cent drank daily when the temperature dropped back to 23 °C.

Feed moisture. When green ground-feed is available demand for water becomes depressed and livestock are able to graze further from the water point. Sheep may be able to source their total water requirement from green feed, while it is available. Cattle however always require regular access to free water supplies.

APPENDIX D—Climate risk and profit

Droughts are common. Climatically, most of the Southern Rangelands is defined as a desert and thus long dry periods are a natural and regular feature. The region is renowned for its 'feast and famine' cycles that tend to bring sequences of above-average seasons followed by below-average seasons. To run a successful pastoral business in this region with its highly variable climate, it is necessary to understand the climatic risk factor and manage for it accordingly.



Example of the 'feast-famine' cycle in the WA Southern Rangelands

The graph shows an example of the irregular pattern of above and below average seasons in the Meekatharra region over the past 100 years. Planning your stocking strategy to capitalise on the 'good' seasons and acting early to avoid the impacts of the 'poor' seasons is a major challenge.

Table 8 provides a guide to the variation in dry matter production that can occur in various land types between 'feast and famine' seasons.

Table 8 Variation in seasonal carrying capacity

Land type	Dry matter production (kg/ha)	
	Best season	Worst season
Saltbush (Yalgoo)	560	40
Mulga-windgrass herbage (Wiluna)	825	Nil
Mulga, stony plains (Meekatharra)	130	11
Wanderrie (Meekatharra)	110	16
Bluebush, stony plains (Gascoyne)	350	40
Saltbush (Nullarbor)	1000	100

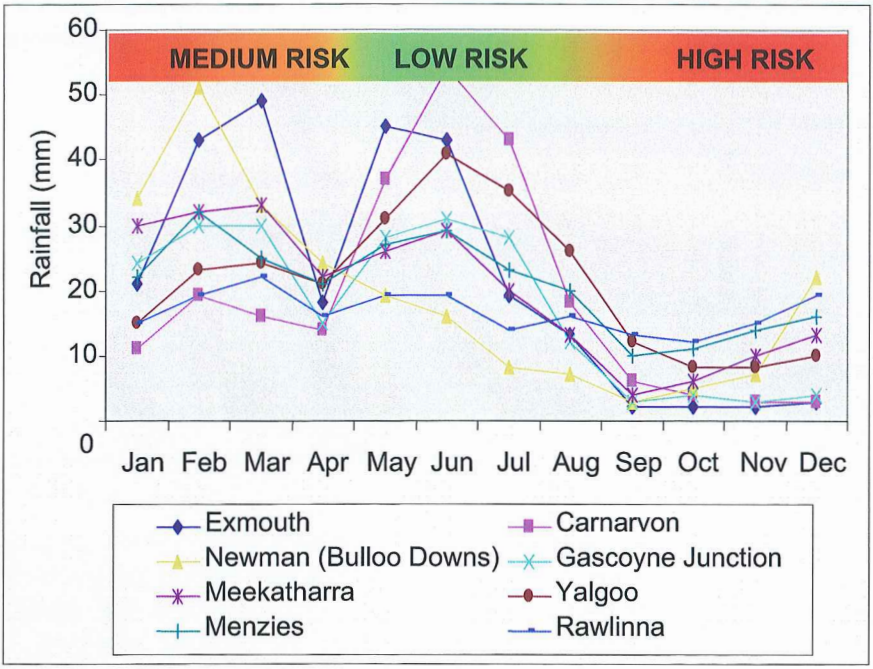
(Adapted from Mitchell and Wilcox, 1994).

The rainfall not only varies greatly from year to year but it can also vary between seasons. It is important that the period of greatest forage demand (for example, lactation) coincides with the period with the highest probability of forage growth (the growing season).

Know and plan around your growing season. Depending on where you are in the Southern Rangelands, a summer or a winter growing season is going to generate the bulk of your forage supply. Out-of-season rainfall can still generate adequate forage. However, it should be used opportunistically where practical and never planned for or relied upon.

When to make your assessment. To optimise production, assessments of forage supply and body condition score should be made on a regular basis. Assessment and calculation of your feed supply should occur at least at the beginning and at the end of the growing season. These two occasions should coincide when adjustments of stocking rate (either up or down) are made.

It is easy to procrastinate. However, the longer you delay making decisions, the fewer options remain. Delayed decisions can also result in lost opportunities to capitalise on above-average seasonal conditions. The graph on page 47 shows the various stages where decisions about stocking rate can be made. It also shows the related risk factor for specific locations throughout the region.



Managing seasonal risk in the pastoral region is important in order to optimise livestock productivity and to improve rangeland condition.

APPENDIX E How to create a pasture monitoring site

Pastoralists use pasture monitoring sites as an aid to land and livestock management. The sites should be installed within a suitable distance of a watering point and can be used to monitor mid- to long-term trends in rangeland condition. Monitoring sites may be employed to assist in feed estimates by providing photo-standards of forage availability at annual decision dates. In conjunction with stock grazing records, comparisons between years may be made to determine appropriate stocking rates to achieve livestock productivity goals. The sites may also be used to track the status of individual key indicator plants to manage utilisation levels. The type of information gathered from these sites is flexible, ranging from photo-only through to numerical recording of species of pasture plants present.

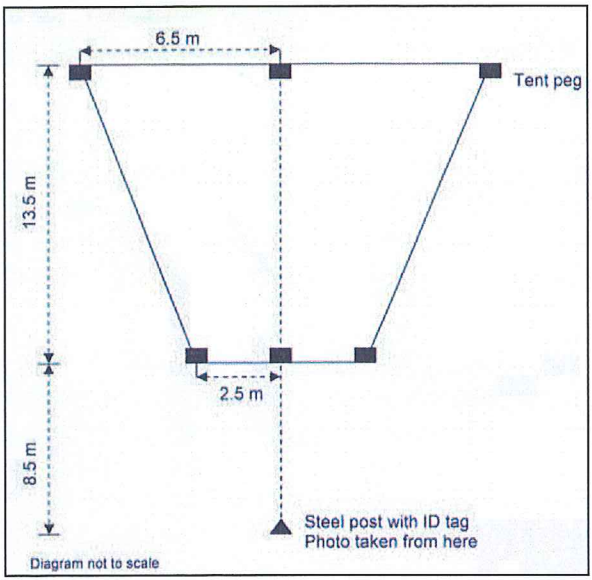
What do I need to put in a site? You will need a 50 m measuring tape, camera, small freestanding whiteboard or chalk board, thick-point whiteboard pen (black) or chalk, stepladder, 1 steel post (per site), 6 tent pegs (per site) and a metal tag or something you can permanently attach to the steel post to identify the site.

Where should monitoring sites be installed? Site selection is very important as poor placement may not tell you anything. Select a site approximately 1.5 km from a water point. Choose a site which is likely to be influenced by grazing pressure or seasonal conditions either positively or negatively (there is no point putting a site in unproductive areas where stock never graze). The site should be representative of the surrounding landscape (preferably in a more productive land type). Orientate the site north-south so that the sun is largely behind the camera position through most of the day. Place the site at least 100 m from a fenceline or track to avoid stock concentrations. Record GPS coordinates and directions from the nearest water point for the site.

Some other handy tips. Mark all sites on the station map for future reference. Walk from track to site with your stepladder rather than drive as stock can learn over time to walk in the tyre tracks. Review

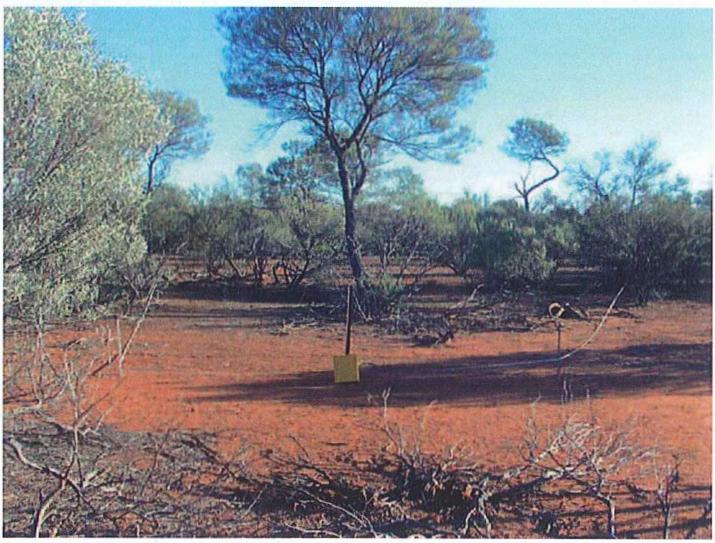
sequential site photographs together with associated rainfall data and stocking histories (including non-domestic livestock). Record and secure all relevant data in a display folder as it may become a substantial asset in the future. As your plant identification and landscape ecology skills improve you may want to upgrade the sites from 'photo only' to more sophisticated data collection (see your local DAFWA office for further advice). All pegs should be tent-peg type to prevent danger to livestock and musterers.

The following diagram illustrates the layout and dimensions of a pasture monitoring site. It is recommended that you photograph the site at least once at the end of each growing season. An example of a pasture monitoring site recording sheet is provided on page 49.



Example only

STATION:	Mulga Station	
SITE NO.:	1	
PADDOCK NAME:	Skippers	
GPS WAYPOINT:	50J 0379854 9025410	
SITE DIRECTIONS:	1.5 km west of Peters Well (100 m north of road)	
LAND SYSTEM:	Tindalarra	
DATE:	30-09-08	
OBSERVERS:	Richard Peters	
MATURE PLANT SPECIES NAME	COUNT	UTILISATION % (0, 25, 50, 75)
Narrow leave mulga	1	0
Fine leaf jam	1	0
Curara	6	0
Broad-leaf mulga	2	0
Tall poverty bush	1	0
Mulga bluebush	16	25
Wild onion	1	0
Silver speargrass	1	25
CURRENT MANAGEMENT (domestic stocking rate)		550 wet ewes



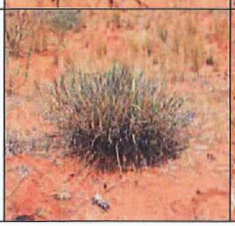
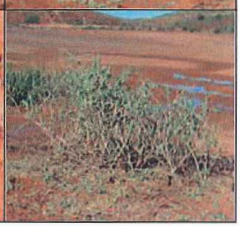
APPENDIX F Utilisation levels of indicator species

How much is too much? Extended periods of moderate-heavy grazing will weaken a plant's ability to recover and in time the plant can die. Hence, it is important that you know what the 'safe' level of utilisation is so that you achieve your rangeland and livestock productivity objectives. For a perennial plant to exist from year to year it must have enough energy and biomass to ensure it can set seed and survive until the next growing season. Over-utilisation can be a major factor hindering that survival.

If a perennial shrub or grass is 'chewed to the ground' it is going to have a very hard time persisting through to the next rainfall event, especially in dry years which occur frequently throughout the region. Therefore, the recommended level of utilisation for any perennial plant is 30 per cent. This means that if more than 30 per cent of the plant is grazed, then its longevity into future seasons can be greatly reduced. By monitoring your pasture and keeping in mind this 30 per cent rule, you can improve range condition and increase your future feed supplies and associated livestock productivity.

Higher utilisation levels may be used within well-managed, intensive grazing systems. However, the rest period will need to be proportionally longer to allow recovery. Higher utilisation rates increase the level of risk to a business. It may bring with it rewards but it will require a higher level of management and control of total grazing pressure. Indicator plants are an invaluable tool for tactical management.

The following table provides a summary of the utilisation levels for a few of the main pasture groups.

% utilisation	**Perennial grass** (e.g. buffel grass)	**Perennial sub-shrub** (e.g. golden bluebush)	**Perennial shrub** (e.g. silver saltbush)
0% (Ungrazed)			
30% (Recommended level of utilisation)			
70+% (Overgrazed)			

APPENDIX G Action strategy options

The focus of this guide is to equip you with the tools you need to keep stocking rate within carrying capacity. The following is a brief summary of your stocking options once you have determined whether you have a surplus or a deficit in feed supply in STEP 7.

The following table outlines some options that can be taken based on the feed surplus or deficit entered into COLUMN E of the feed reconciler table (Table 7.1).

CARRYING CAPACITY SURPLUS	CARRYING CAPACITY DEFICIT
1. Opportunity to increase stocking rate - purchase additional animals to utilise the surplus feed - agistment onto property - hold on to sale animals longer to increase the value per head **2. Opportunity to improve some paddocks** - maintain current stock numbers - 'bank' the extra feed and increase the perennial haystack for future dry periods - improve rangeland condition to enhance the productive capacity of the paddock	**3. Reduce hazard by reducing stocking rate** - implement a livestock sale strategy, where the least valuable animals are priority sales, followed by the most 'easily' sold (e.g. steers, wethers), then eventually breeders if conditions continue to deteriorate - agistment off property **4. Do not join and/or wean earlier** - take pressure off breeders by not joining targeted groups - wean earlier than usual and sell or agist calves **5. More effective total grazing management** - muster and sell all unmanaged goats if present - segregate dry stock from breeders - control watering points with total grazing management (TGM) yards - targeted culling program of kangaroos, camels, donkeys **6. Increase the grazing area** - water point development to improve grazing animal distribution (this tends to be a mid to longer term plan) **7. Move to another paddock in surplus** - move animals to a paddock that has a carrying capacity surplus **8. Short-term supplemental feeding** - feed stock for a short period while preparing to implement other options (mid to long term feeding in the region is not recommended on the basis of cost)

APPENDIX H Body condition scoring sheep and goats

Body condition scoring (BCS) is a 'hands on' method of determining the amount of fat an animal is carrying. The advantage of a condition score measurement is that it is easy to learn, fast, cheap, does not require specialised equipment and is sufficiently accurate for management practices. The simple condition score has many management implications.

Condition scoring sheep and goats is an easy and accurate method of estimating the condition or 'nutritional wellbeing' of your mob. It requires you to assess the amount of tissue and fat covering the backbone and the short ribs of each animal. Each individual assessment should only take a matter of seconds. BCS is based on a 1 to 5 scale (1 is very thin and 5 is grossly fat). The recommended BCS for sheep and goats is 3 at joining and 2.5 throughout the rest of the year. The minimum number of animals required to give you a representative sample of the mob is 25 (this should be a random sample of roughly the same line of stock, for example, ewes *vs* wethers).

Why use condition scoring instead of liveweight?

- It can be done anywhere animals can be yarded.
- It is done without having to correct for wool growth, influence of wet wool or gut-fill.
- It needs no correction for foetus weight in pregnant animals or fluids during lactation.
- It can be used on a mob of animals with different frame sizes.

What is the difference between condition score in relation to fat score? There is a strong correlation between condition score and fat score but when managing breeding mobs it is more sensitive to use condition score than fat score.

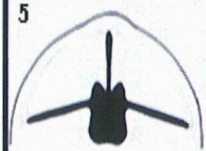
How do I body condition score? The animal should be standing in a relaxed position. It should not be tense, crushed by other animals or held in a crush. If the animal is tense, it is not possible to feel the

short ribs and get an accurate BCS. Place your thumb on the backbone just behind the last long rib and your fingers against the stubby ends of the short ribs. Use the scoring system described below to assign a score. Many people use a system of half scores such as 2, 2.5, 3 or 3.5.

Randomly draft 25 animals of the same class (for example, 25 maiden ewes). Many people choose a couple of animals from each full race when drenching or doing some other animal husbandry task. Be sure to record the scores so that you can calculate the average. A simple method of calculating the median of the mob is to use the Condition Score Worksheet (see Appendix J). This not only gives you a middle point but also shows the range of scores and can identify if there is a significant 'tail' in the mob.

To increase the value of condition scoring it is worthwhile comparing the median (middle number) score against a reproductive assessment figure such as lambing or weaning rates.

Condition score description

1 	**Backbone** The bones form a sharp narrow ridge. Each vertebra can be easily felt as a bone under the skin. There is only a very small eye muscle. The sheep is quite thin (virtually unsaleable)	**Short Ribs** The ends of the short ribs are very obvious. It is easy to feel the squarish shape of the ends. Using fingers spread 1cm apart, it feels like the fingernail under the skin with practically no covering
2 	**Backbone** The bones form a narrow ridge but the points are rounded with muscle. It is easy to press between each bone. There is a reasonable eye muscle. Store condition- ideal for wethers and lean meat.	**Short Ribs** The ends of the short ribs are rounded but it is easy to press between them. Using fingers spread 0.5cms apart, the ends feel rounded like finger ends. They are covered with flesh but it is easy to press under and between them.
3 	**Backbone** The vertebrae are only slightly elevated above a full eye muscle. It is possible to feel each rounded bone but not to press between them. (Forward store condition ideal for most lamb markets now. No excess fat).	**Short Ribs** The ends of short ribs are well rounded and filled in with muscle. Using 4 fingers pressed tightly together, it is possible to feel the rounded ends but not between them. They are well covered and filled in with muscle.
4 	**Backbone** It is possible to feel most vertebrae with pressure. The back bone is a smooth slightly raised ridge above full eye muscles and the skin floats over it.	**Short Ribs** It is only possible to feel or sense one or two short ribs and only possible to press under them with difficulty. It feels like the side of the palm, where maybe one end can just be sensed.
5 	**Backbone** The spine may only be felt (if at all) by pressing down firmly between the fat covered eye muscles. A bustle of fat may appear over the tail (wasteful and uneconomic).	**Short Ribs** It is virtually impossible to feel under the ends as the triangle formed by the long ribs and hip bone is filled with meat and fat. The short rib ends cannot be felt.

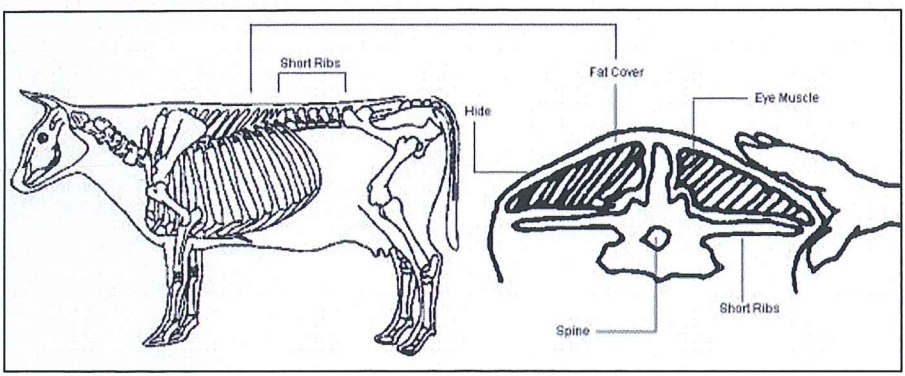
APPENDIX I Body condition scoring beef cattle

Body condition scoring of beef cattle is very similar to sheep and goats. The BCS scale for cattle is 1 to 5. The fat cover over the loin area between the hip (hook) bone and the last rib is the major location on the animal's body used for condition scoring, especially in thin animals. It is measured by placing your hand on the loin area, fingers pointing to the opposite hipbone. With your thumb, feel the fat cover over the ends of the short ribs (Figure 1).

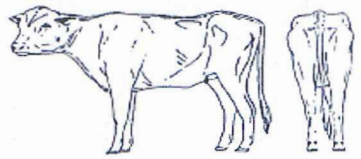
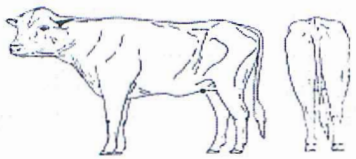
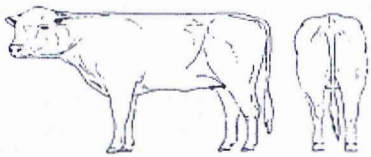
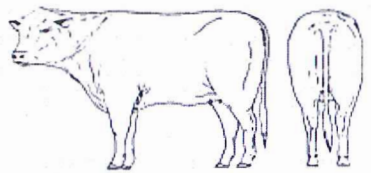
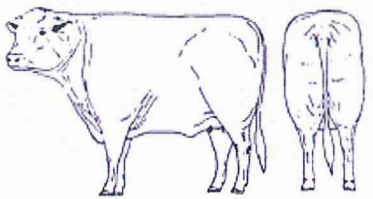
Since there is no muscle between the end of the short ribs and the skin, any padding felt by the thumb will be fat. In cows that score above 3, the short ribs can no longer be felt, even with firm pressure. Therefore, in fatter cattle, the fat cover around the tail head and over the ribs is also used to assess the animal's condition score.

Half values may be used (2, 2.5, 3, 3.5, etc.). The recommended BCS for cattle is 3 and for cows and heifers at weaning it is 2.5

Where to condition score?



How to body condition score? Use the following descriptions and pictures as a guide to assess BCS.

Score 1: The individual short ribs are fairly sharp to the touch and there is no fat around the tail head. The hip bones, tail head and ribs are visually prominent	
Score 2: The short ribs can be identified individually when touched but feel rounded rather than sharp. There is some tissue cover around the tail head, over the hipbones and the flank. Individual ribs are no longer obvious.	
Score 3: The short ribs can only be felt with firm pressure. The areas on either side of the tail head now have a degree of fat cover that can be easily felt.	
Score 4: Fat cover around the tail head is evident as slight 'rounds', soft to the touch. The short ribs cannot be felt even with firm pressure. Folds of fat are beginning to develop over the ribs and thighs of the animal.	
Score 5: The bone structure is no longer noticeable and the animal presents a 'blocky' appearance. The tail head and hipbones are almost completely buried in fat and folds of fat are apparent over the ribs and thighs. The short ribs are completely covered by fat and the animal's mobility is impaired by the large amounts of fat carried.	

APPENDIX J Using the body condition score worksheet

You can use the Condition Score Worksheet for recording the BCS values you assess. It is important that the same class of animals be recorded. For example, in a control mated herd or flock the chart can be used for a mob of breeders. For an uncontrolled herd or flock it is important to note whether the breeders are wet or dry.

Randomly draft 25 animals into a race or choose a random group from the middle of the mob. Record the scores in the corresponding column of the worksheet. The worksheet allows you to calculate the median (middle value) of the mob, which will give you an idea of how the mob is 'tracking'. It not only gives you a middle point but also shows the range of scores and whether there is a significant 'tail' in the mob that may need to be managed for.

Record the condition score of each animal with an 'X' on the chart. The median score of the mob is the score at the middle of the distribution (between the 12th and 13th cross when counting from the LEFT of the score sheet) and in the example below, it is 3.0 (or a 2.8 average).

Example of a completed body condition score worksheet

				x				
				x				
			x	x				
			x	x	x			
			x	x	x			
		x	x	x	x			
	x	x	x	x	x			
	x	x	x	x	x	x		
1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

Counting from the left and from the bottom the median (middle value) of the mob is 3.

APPENDIX K Field worksheets to be copied and used

This worksheet is to be used for your individual paddock assessments as explained in STEPS 1 to 3. Each paddock will require a new log sheet.

Paddock carrying capacity log sheet

Feed estimate number	**Land type** (record the land type the estimate was made in)	**Square side length** (estimates from the square method)	**DDH** (DSE DAYS per hectare)	**Cumulative DDH tally** (add DDH estimates 1–10)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
A. DDH TOTAL (sum of 1 to 10)				DDH
B. AVERAGE DDH for paddock (A ÷ 10)				DDH
C. TOTAL FEED SUPPLY for the paddock (B x area of paddock in ha)				DSE DAYS

This worksheet is to be used to calculate the total feed demand in each of your paddocks across the whole station as explained in STEPS 4 to 6. Each row is for an individual paddock.

Total grazing pressure calculator

Paddock name	DSE demand per day				(E) Total DSE demand per day (A+B+C+D)	(F) Grazing period length (days)	Total demand (DSE DAYS) (E x F)
	(A) Daily flock/herd demand (enter the value from STEP 5)	(B) Kangaroos (estimated No. x 0.7 DSE)	(C) Unmanaged goats (estimated No. x 1.5 DSE)	(D) Other (horses, camels, rabbits) (estimated No. x DSE)			

This worksheet allows you to bring all your feed supply estimates and feed demand calculations together to assess whether your current strategy will effectively align stocking rate with carrying capacity on a paddock and whole station basis. It has provisions for planning in response to surplus or deficits.

Feed supply-demand reconciler

Name of paddock or water point	**(A)** **Feed supply (DSE DAYS)** (enter the value from STEP 3)	**(B)** **Feed demand (DSE DAYS)** (enter the value from STEP 6)	**(C)** **Feed supply-demand Balance** (A – B)	**(D)** **Rangeland condition target** (maintain or improve?)	**(E)** **Action strategy required to achieve objectives**

This worksheet is to be used when you body condition score your flock or herd as explained in appendixes I, J and K.

Body condition score sheet

Paddock: Date: Animal class:								
1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

References

Burnside D, Holm A, Payne A and Wilson G (1995) 'Reading the Rangeland—a guide to the arid shrublands of Western Australia', Department of Agriculture Western Australia (Frank Daniels Pty Ltd).

Mitchell A and Wilcox D (1994) 'Arid shrubland plants of Western Australia', Department of Agriculture Western Australia (Scott Four Colour, Perth).