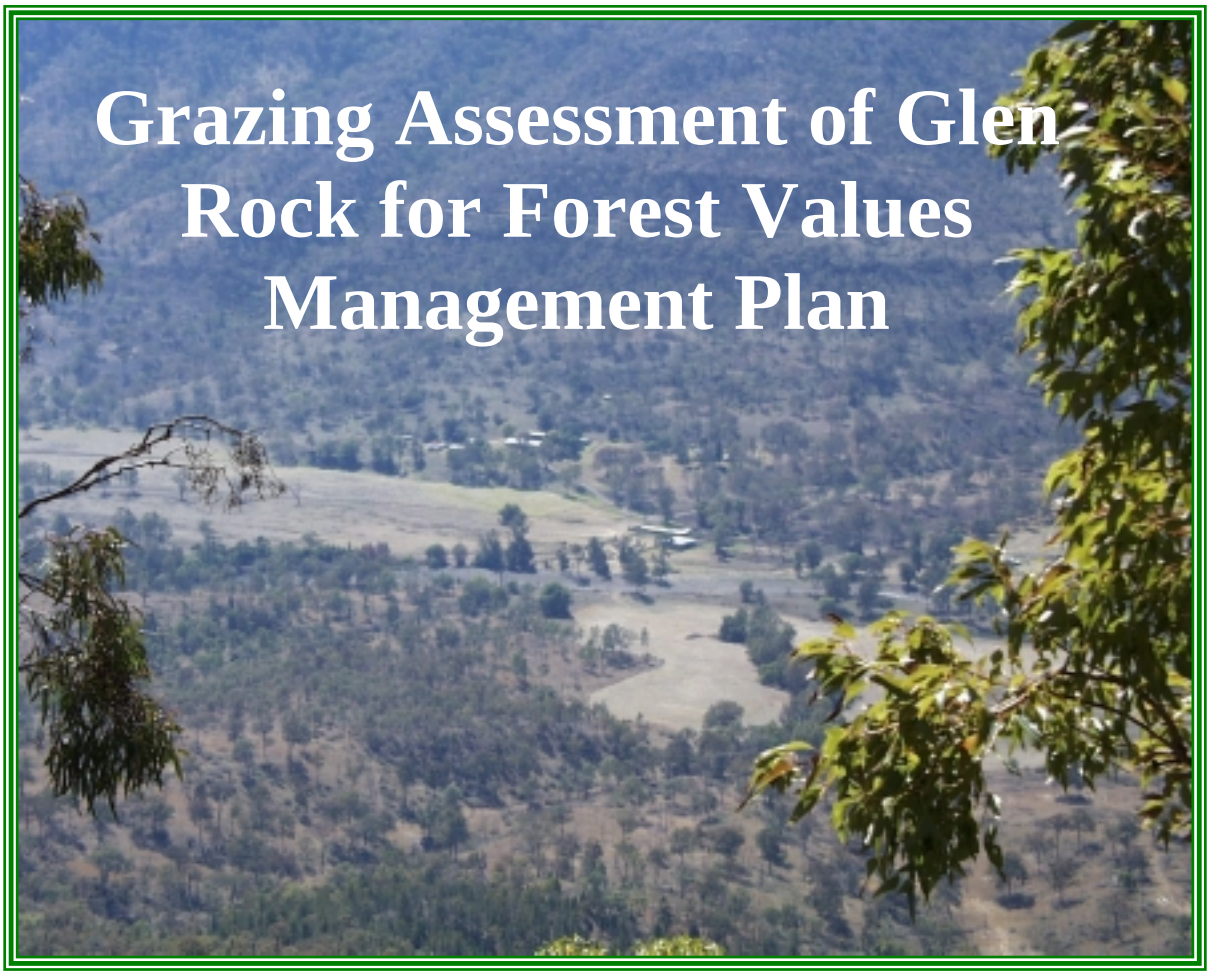
Grazing Assessment of Glen Rock for Forest Values Management Plan



(View of Glen Rock Homestead from Christie's Tableland, GR.010)

Prepared by: Andrew Young
Forest Planner
Department of Natural Resources
Gympie

2nd April 2001

For more information contact:

Forest Planning and Sustainable Use Unit
Vegetation Management and Use
Department of Natural Resources
PO BOX 2454
4th Floor, Charlotte Chambers
35 Charlotte Street
BRISBANE ALBERT STREET QLD 4001

Ph: 07 3234 0146
Fx: 07 3239 3849

Disclaimer
The views and opinions expressed in this report are those of the author and do not necessarily reflect the views of the Queenland government. The Queensland government does not accept responsibility for any advice or information in relation to this material.

ACKNOWLEDGEMENTS

I would like to thank the Grazing Resource Assessment Team for the time and effort they invested in this study.

Andrew Young
DNR -Regional Forest Planner
Gympie

CONTENTS

ABBREVIATIONS

DNR	Queensland Department of Natural Resources
GR	Glen Rock
GR.01a, GR.002	Glen Rock Planning Units 01a and 002, etc.
PUID, PUIDs	Planning Unit/s
USL	Unallocated State Land

(Grazing Assessment Team discussing some issues during a coffee break, Cook's Tableland, GR.012)

SUMMARY

This study has divided Glen Rock into 14 Planning Units (PUIDs) and has assessed the grazing value of each separate area. These results are presented in Figure 4.1.

There is a core area, defined as "Excellent" grazing that follows the main creek lines through the centre of the property. This would be expected as this area has been developed to the highest degree, is well fenced, has good access to water and is easily accessible from the Homestead. A point to note is that the property has over 30% of its area classified as "Good to Excellent" grazing country.

The Glen Rock property has been managed very conservatively for many years which has preserved its significant natural resources in a robust and sustainable.

The grazing values obtained from this study have been transferred from the 14 PUIDs defined by the Grazing Assessment Team into these 77 PUIDs used by the Management Team. (See Figure 4.4) A simple area-weighting calculation was used to determine the grazing value score of each of the 77 PUIDs.

The conservation values that exist now demonstrate that conservative grazing management is not necessarily in conflict with conservation issues. The Assessment Team considers that the continued conservative grazing management, when combined with a well-planned conservation strategy, would be even more effective in promoting conservation values.

Recreation was considered in terms of how stock management might be altered to enhance people's recreation experiences. In some cases, this may involve moving stock off a particular area. In other instances, having stock present may actually enhance the recreational experience. Both of these situations would be taken on-board in future management decisions.

1. INTRODUCTION

1.1 AIMS AND OBJECTIVES

The aims of this grazing study were to:

- divide the Glen Rock property into homogeneous planning areas (PUIDs)
- assess the grazing value of each of these areas in consultation with grazing experts
- represent the assessed grazing values in digital and hard-copy map form
- present the data, assessments, maps and discussions to the management committee in the form of a final report

1.2 BACKGROUND AND OVERVIEW

The Queensland Department of Natural Resources has developed its management planning system to deliver ecologically, economically and socially acceptable outcomes for State Forests, recreational and other areas, in a complex social environment. The planning process incorporates worlds best practice methods, techniques and technology to give site-specific management and operational guidelines.

Forest values are assessed using models so that results are scientific, verifiable and accountable. Recognised experts, from both the scientific and public communities, are sought to provide input into the models and assessment processes.

A Community Values survey is carried out at different levels of influence. This provides social input at the local, regional, state, national and even international levels. These social values are then used to place the forest values in question in the broader social context.

A brief description of the 8 phases in the planning process is included in Appendix 1.

The Grazing Model has been developed by DNR Forest Resources, as a sub-component of DNRs planning system, to assist in assessing grazing values for management plans. It has been trialed at Allies Creek State Forest, Clements State Forest, Braemar State Forest and has been used in assessing cleared State forest land for plantations. Several comments and improvements, resulting from field use, have been incorporated into the current version (3.1) of the model.

A detailed description of how the model operates is included in Appendix 2.

2. METHODOLOGY

2.1 ASSESSMENT TEAM

The assessment team was made up of 4 members. These were:

- Ken Murray — Glen Rock Property Manager, DNR
- Russell Turkington — Grazier
- Stuart Cooke — Grazier
- Neil Lake — Lessee
- Andrew Young — Regional Forest Planner, DNR – Gympie

This community and agency group arrived at Glen Rock on Sunday night 20 August 2000 to begin the assessment first thing on Monday. They finished at 5:00 pm on Tuesday 22 August 2000.

2.2 ASSESSMENT METHODS

The assessment team divided the property into 16 preliminary planning units (PUIDs) before the inspection and used this as a rough guide in inspecting homogenous areas. These were modified into 14 PUIDs after inspection and are shown in Figure 1.

About half of the PUIDs when assessed, had their scores entered into the spreadsheet model on-site. (For a detailed description of the Grazing Model Version 3.1, see Appendix 2.) However, as this was time consuming several planning units were completed from notes and discussion in the evening.

Comments were entered where appropriate for justifying the decisions reached. These are included in Appendix 4.

2.3 DATA TECHNIQUES/BACKGROUND RELEVANT TO GLEN ROCK

The Grazing Model has been used in several studies and has been modified as a result of the comments and results arising from these analyses. Some of the locations where the model has been applied are:

- Allies Creek Power Line Report - south of Mundubbera
- Breamer State Forest - south west of Dalby
- Plantation Assessment Process - various sites
- Toomulla USL Assessment - north of Townsville
- Connors/Clark (in progress) - near Mackay

It has been found that a panel of 4 to 5 is the ideal size for ease-of-assessment perspective in terms of adequate panel discussion and ease and speed of transport.

Evaluating grazing values usually involves the following process and sequence:

- an inspection of the planning unit (PUID)
- selection of a "representative" site for discussion and analysis
- detailed discussion of the PUID qualities and relating these to the different criteria of the model
- entry of criteria scores into the model
- discussion of the accuracy of the Overall Grazing Score compared with panel members assessments
- re-visit any criteria until consensus is reached
- modification of the model to suit local conditions if required.

Experience has shown that this process is followed for 2 or 3 sites. After this, people are familiar with the course of action and the process becomes much more streamlined.

2.4 DATA MANAGEMENT FRAMEWORKS/PATHWAYS

Generalised outline of assessment and information pathways for the grazing assessment.

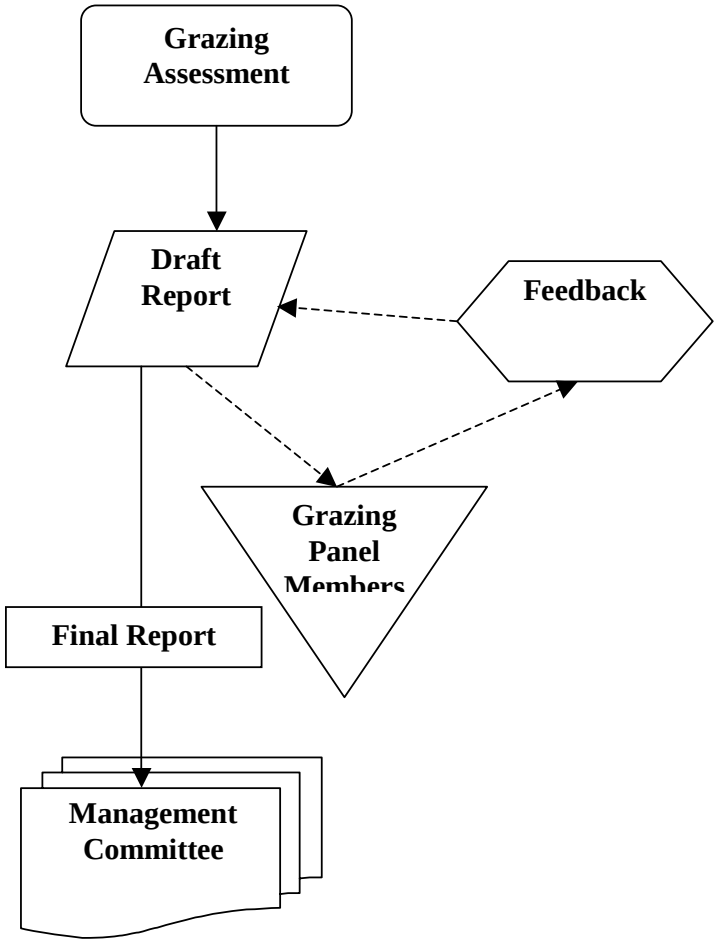
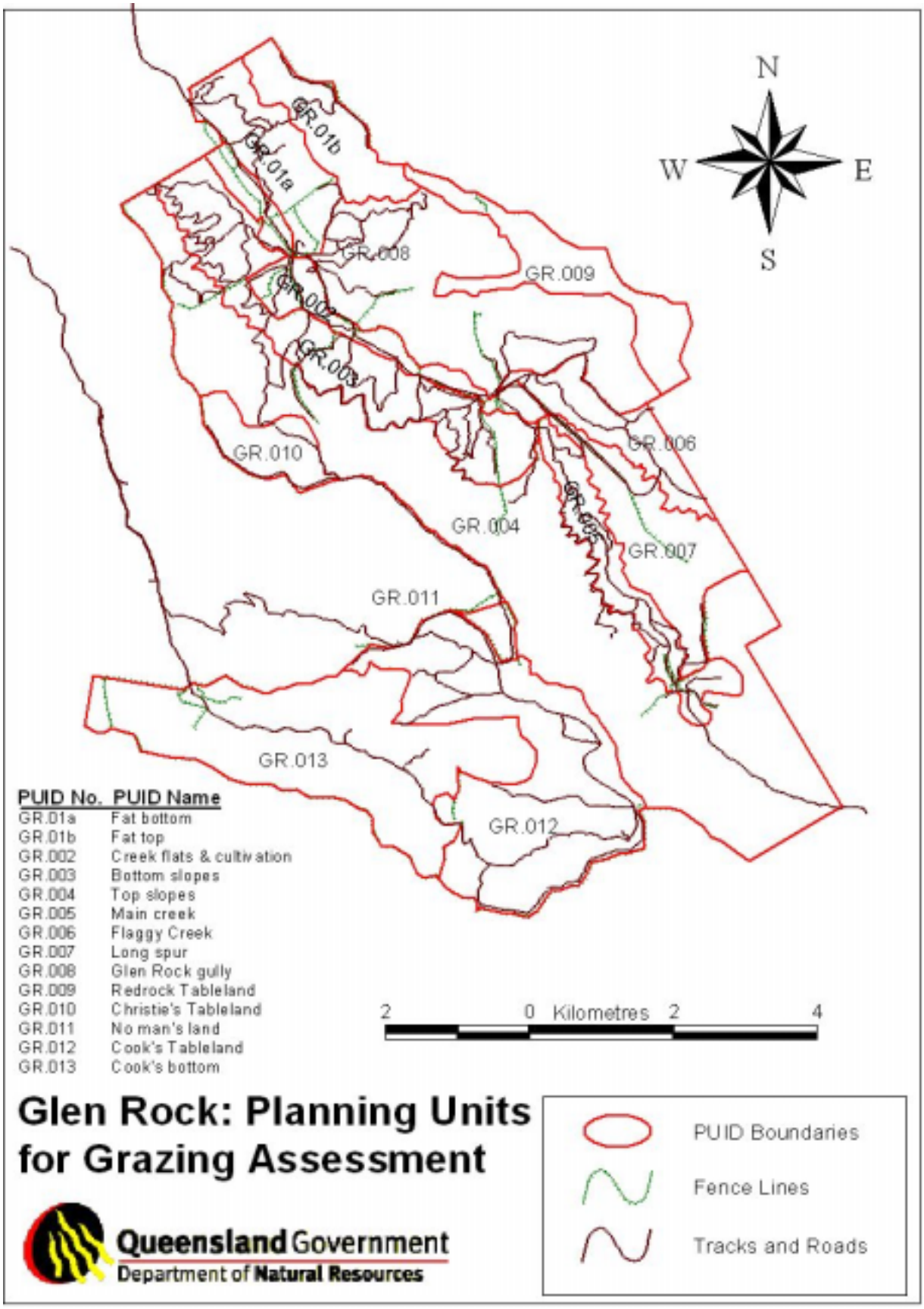


Figure 2.1: **Planning Unit boundaries used by the Grazing Assessment Team**



3. RESULTS

3.1 ASSESSMENT RESULTS - GENERAL

Table 3.1.1 All Criteria Scores and Grazing Scores for Glen Rock

PUIDs	PUID Names	Carrying Capacity	Herd Size	Herd Composition	Water	Mustering	Fence Damage	Declared pests	Infrastructure & Maintenance	DNR Response Time	Access management	Original Rating	Re-Scaled Rating
GlenRock.01a	**Fat bottom**	8	10	5	9	8.5	8	8	10	10	10	**7.63**	**6.06**
GlenRock.01b	**Fat top**	6.5	10	5	7	8	8	8	10	10	10	**6.95**	**5.53**
GlenRock.002	**Creek flats & cultivation**	9.5	10	5	9	8	8	6	10	10	10	**7.86**	**6.25**
GlenRock.003	**Bottom slopes**	7	10	5	7.5	5	7	4	10	10	10	**5.84**	**4.64**
GlenRock.004	**Top slopes**	7	10	5	8	3	7	6	10	10	10	**5.66**	**4.50**
GlenRock.005	**Main creek**	7.5	10	5	9	7.5	7	6	10	10	10	**7.22**	**5.74**
GlenRock.006	**Flaggy creek**	9	10	5	10	7.5	9	6	10	10	10	**7.84**	**6.23**
GlenRock.007	**Long spur**	7	10	5	7.5	3.5	6	6	10	10	10	**5.69**	**4.52**
GlenRock.008	**Glen Rock gully**	7	10	5	7	2	6.5	2.5	10	10	10	**4.96**	**3.95**
GlenRock.009	**Redrock tableland**	7.5	10	5	7.5	2	8	5	10	10	10	**5.60**	**4.45**
GlenRock.010	**Christies Tableland**	8.5	10	5	7	5	9	6.5	10	10	10	**7.13**	**5.66**
GlenRock.011	**No Man's Land**	5	10	5	7	7	9	6.5	10	10	10	**6.41**	**5.10**
GlenRock.012	**Cook's Tableland**	9	10	5	7.5	6	6.5	5	10	10	10	**7.20**	**5.72**
GlenRock.013	**Cook's Bottom**	7	10	5	3.5	2	5	2.5	10	10	10	**4.71**	**3.75**

Table 3.1.2 General Comments made at individual Planning Units

PUIDs	PUID Names	Comment 1	Comment 2	Comment 3	Comment 4
GlenRock.01a	**Fat bottom**	Better to divide paddock into 4 paddocks to get even grazing & work all counter & not concentrate along creeks	Better for biodiversity also.	NB. Rating scores for all relevant local properties, not best State forests as model designed for	Fence Damage redefined as: visitors to GR, trees falling over fences (lighting, storms), gates left open, floods
GlenRock.002	**Creek flats & cultivation**	Flood is a risk	Floods also can bring/spread weeds		
GlenRock.007	**Long spur**	Majority of this country is susceptible to woody weed infestation	Many areas have a little already but management activities reduced this to current levels		
GlenRock.008	**Glen Rock gully**				
GlenRock.009	**Redrock tableland**	True potential of property not realised yet	Proper infrastructure (roads/fences) would improve productive capacity	And weed control - she oak, bull oak, pink box, lantana	
GlenRock.010	**Christies Tableland**	Approx 740 breeders on GR	Keep cows & calves away from public areas, but away from dog attack	High maintenance, dog baiting etc	Risk factors are getting grown in and pasture and CC and mustering will fall away
GlenRock.011	**No Man's Land**	1400 wieners/feeders	+ 500 breeders	+ 1000 bullocks	Neil's estimates[1]
GlenRock.012	**Cook's Tableland**	1535 dry heifers	Kens estimate[2]	Plus potential to irrigate 200 acres & rum better than 1 beast to 1 acre (1 beast / 3/4 acre)	Best grazing country and minimal pests

1. Neil's Estimates	1400 weiners/feeders				
2. Ken's estimate (1535 dry heifers)	Fat 120-150	Glen Rock 80-100	Mares 50-80	Christies 100–120	Head 100-120
	B Bullock 80–100	40 acres 20	Flaggy 150-180	Main 150-170	Silk 10
	Airstrip 40	Top Starvation 20	Laneway 10	Cooks top & Bottom 150–170	
	Well shed 20	Holding 10	Abbots 25	Top Bullock 120–130	
	Trap Paddock 20	Redrock 40			

3.2 ASSESSMENT RESULTS – PUID BY PUID

3.2.1 PUID GR.01a

General description

Planning Unit GR.01a is situated at the main entrance to the property. It has been highly developed due to its proximity to the homestead, water sources, yards and alternative paddocks. It is comprised of gentle to moderate grassed slopes with adequate shelter (trees) and watering points. PUID GR.01a is 238.5 Ha in area.

Figure 3.2.1: Planning Unit GR.01a

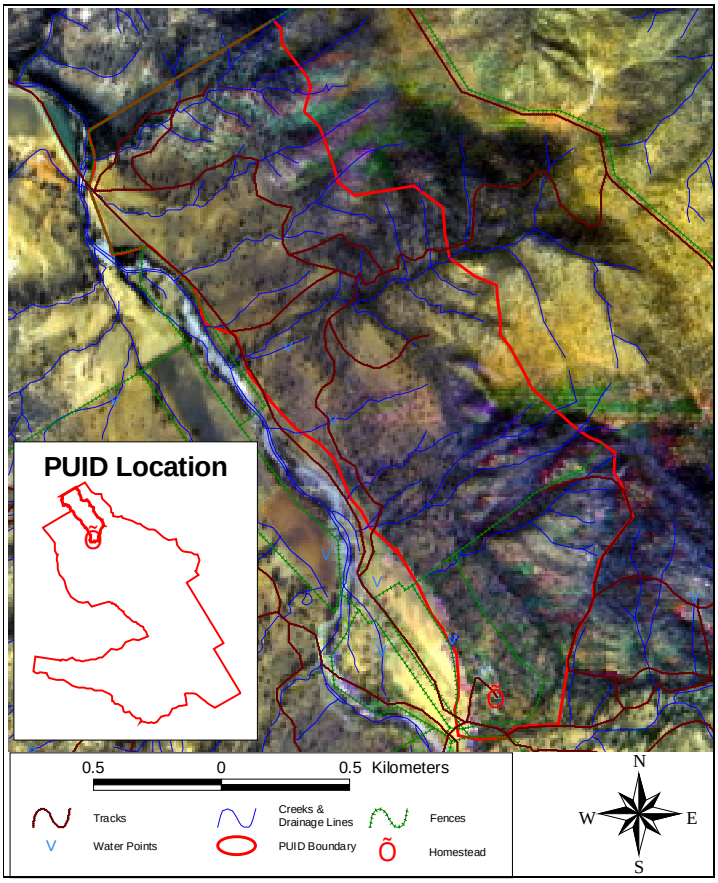


Table 3.2.1: Grazing Scores and Comments for PUID GR.01a

Grazing Criteria	Raw Scores	Comment 1	Comment 2	Comment 3
Carrying Capacity	8	1 beast / 10 ac (conservative estimate) or 17 ac per / cow & calf	Better than most similar managed, similar country	Maintain similar tree cover to maximise grazing & biodiversity
Herd Size	10			
Herd Composition	5	Need to know what sort (heifers, bulls, steers, etc.) cattle mgmt plans to graze/use	Running weaner to feeder cattle - weaner (from 150kg) up to 350-380 kg	Heifer energy consumption = approx 40% of bullock requirements
Water	9			
Mustering	8.5	Depends on temperament and treatment	If paddock boundaries good then easy	Treatment by visitors important also
Fence Damage	8	These risks subject to management of GR finally	Redefined as: visitors to GR, trees falling over fences (lighting, wind storms), gates left open, floods	
Declared pests	8	Lantana is major pest plant	Can be toxic and cause cattle losses or poor weight gain	Wild dogs problem also esp. with calves
Infrastructure & Maintenance	10	Stocking levels maintained by thinning/ weed control as required		
Response Time	10			
Access Mgmnt	10			
Grazing Value	**7.63**	**Rescaled Rating**	**6.06**	

3.2.2 PUID GR.01b

General description

Planning Unit GR.01b is situated close to the main entrance to the property. It has been highly developed due to its proximity to the homestead, water sources, yards and alternative paddocks. It is comprised of moderate to steep grassed slopes with ample shelter (trees) and some watering points. PUID GR.01b is 193.4 Ha in area.

Figure 3.2.2: Planning Unit GR.01b

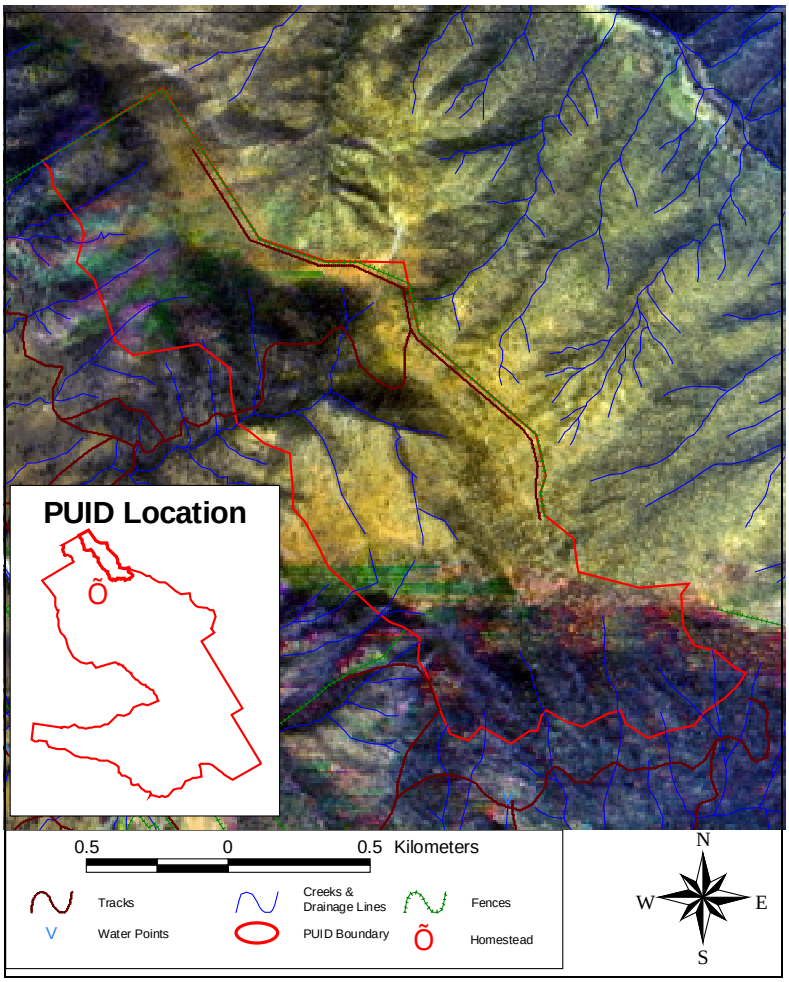


Table 3.2.2: Grazing Scores and Comments for PUID GR.01b

Grazing Criteria	Raw Scores	Comment 1	Comment 2	Comment 3
Carrying Capacity	6.5	1 beast / 20 - 25 acres (conservative estimate)	Can't carry as many head, but very good quality fattening country	
Herd Size	10			
Herd Composition	5			
Water	7	Max distance between water points = 1 - 1.25 km cf. to 4 km on flat country		Springs in gullies and rock outcrops
Mustering	8	Control cattle by controlling water points	Need to manage timber regrowth to improve mustering	
Fence Damage	8			
Declared pests	8	Need to watch Limnea snails at springs		
Infrastructure & Maintenance	10			
DNR Response Time	10			
Access Management	10			
Grazing Value	**6.95**	**Rescaled Rating**	**5.53**	

3.2.3 PUID GR.002

General description

Planning Unit GR.01b is situated close to the main entrance to the property. It has been highly developed due to its proximity to the homestead, permanent water sources, yards and ability to provide irrigation water to adjacent paddocks. It is comprised of grassed river/creek flats with ample shelter (trees). The area is fenced into several paddocks. PUID GR.002 is 220.3 Ha in area.

Figure 3.2.3: Planning Unit GR.002

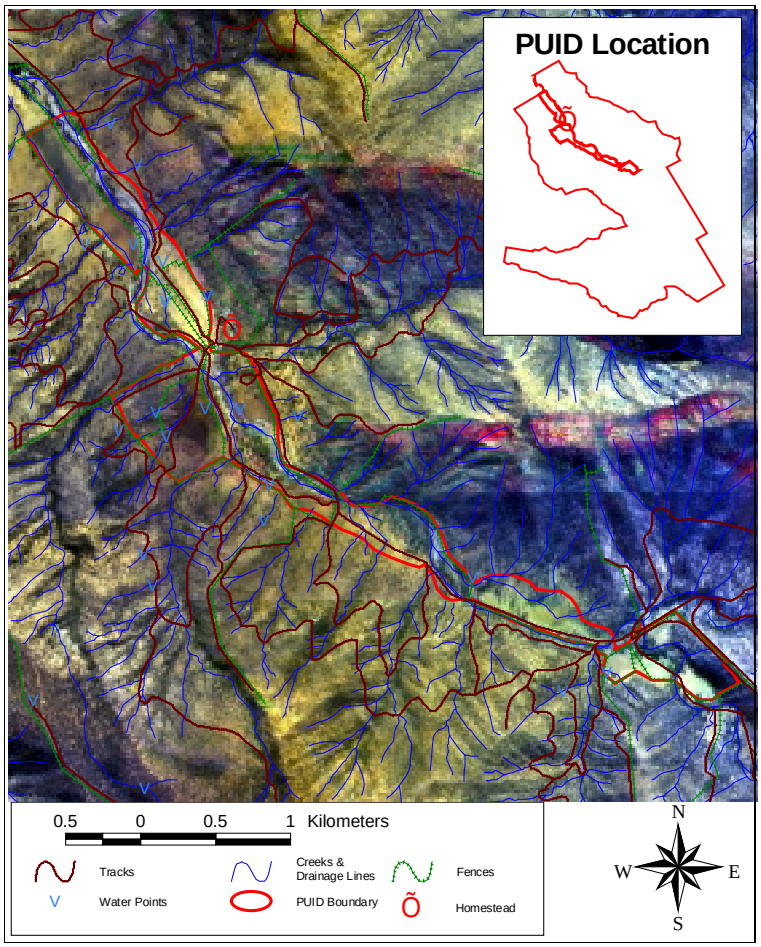


Table 3.2.3: Grazing Scores and Comments for PUID GR.002

	Raw Scores	Comment 1	Comment 2	Comment 3	Comment 4	Comment 5
Carrying Capacity	9.5	1 beast / 5 acres	Pasture not used to best at present	Creek flats at Laidley would get a 10/10	Approx 1/2 cultivation/improved pasture	
Herd Size	10					
Herd Composition	5					
Water	9					
Mustering	8					
Fence Damage	8	Floods are major risk to fences here	Supervision is easy (road past all)	Can easily see, therefore score as 8		
Declared pests	6	Lantana	Wild dogs	Star of heaven - cattle gives scours	Bit of rag weed but no adverse effect on cattle	Worms are a bit of a problem
Infrastructure & Maintenance	10					
DNR Response Time	10					
Access Management	10					
Grazing Value	**7.86**	**Rescaled Rating**		**6.25**		

3.2.4 PUID GR.003

General description

Planning Unit GR.003 is situated along the moderate slopes to the south of the homestead. It has been highly cleared to allow maximum grazing but has ample shelter (trees) remaining. Although there 8 or 9 watering points, these are concentrated mainly in the center of the PUID. PUID GR.003 is 220.3 Ha in area.

Figure 3.2.4: Planning Unit GR.003

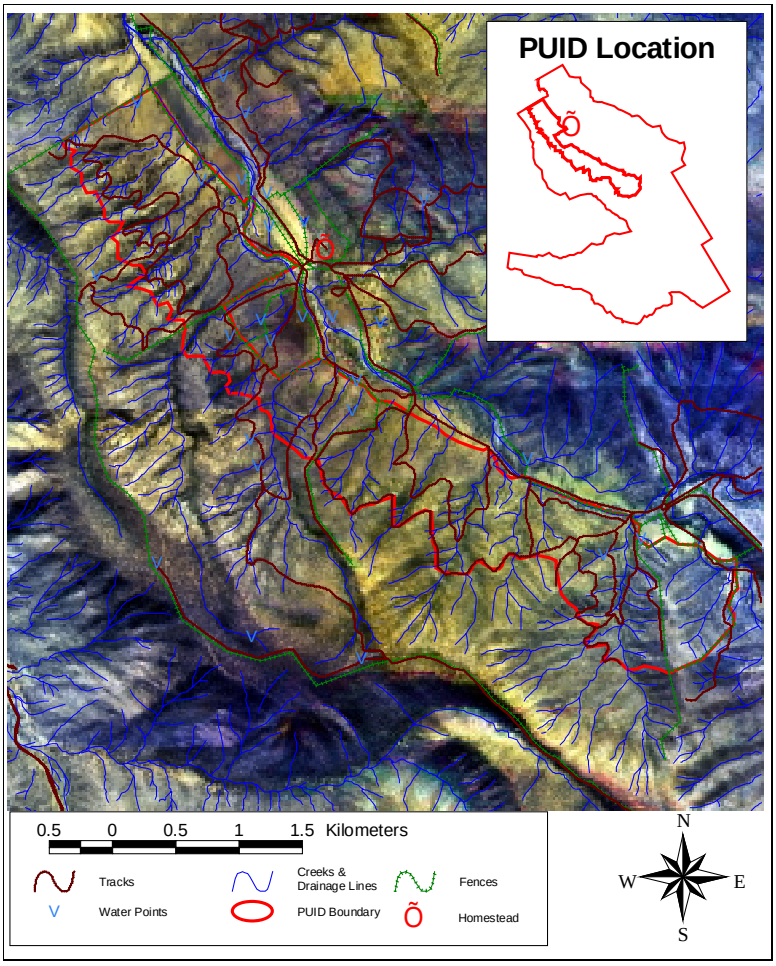


Table 3.2.4: Grazing Scores and Comments for PUID GR.003

	Raw Scores	Comment 1	Comment 2	Comment 3	Comment 4
Carrying Capacity	**7**	About 1/2 way between 01a & 01b			
Herd Size	**10**				
Herd Composition	**5**				
Water	**7.5**	Less than 1 km between water	Not too steep, cf. 01b		
Mustering	**5**	Some areas are very difficult!	Low country is okay	Some gullies very thick	
Fence Damage	**7**	Less risk of people, higher risk of trees	Bit of fire damage but not much	Not too bad over all	Most fences handy to vehicle
Declared pests	**4**	Wait a while, Cocks spur,	Black cypress is a pest to grazing	Cypress causes erosion as needles kill grass, shrubs!	Erosion causes allow wash outs
Infrastructure & Maintenance	**10**				
Response Time	**10**				
Access Management	**10**				
Grazing Value	**5.84**	**Rescaled Rating**	**4.64**		

3.2.5 PUID GR.004

General description

Planning Unit GR.004 is situated along the moderate to steep slopes that run the entire length of the property to the south of the homestead. It has been cleared to allow grazing where accessible but has ample shelter (trees) remaining. There are 3 to 4 man-made watering points towards the northern end of the PUID, the rest is serviced by natural waterholes. PUID GR.004 is 1,617.8 Ha in area.

Figure 3.2.5: Planning Unit GR.004

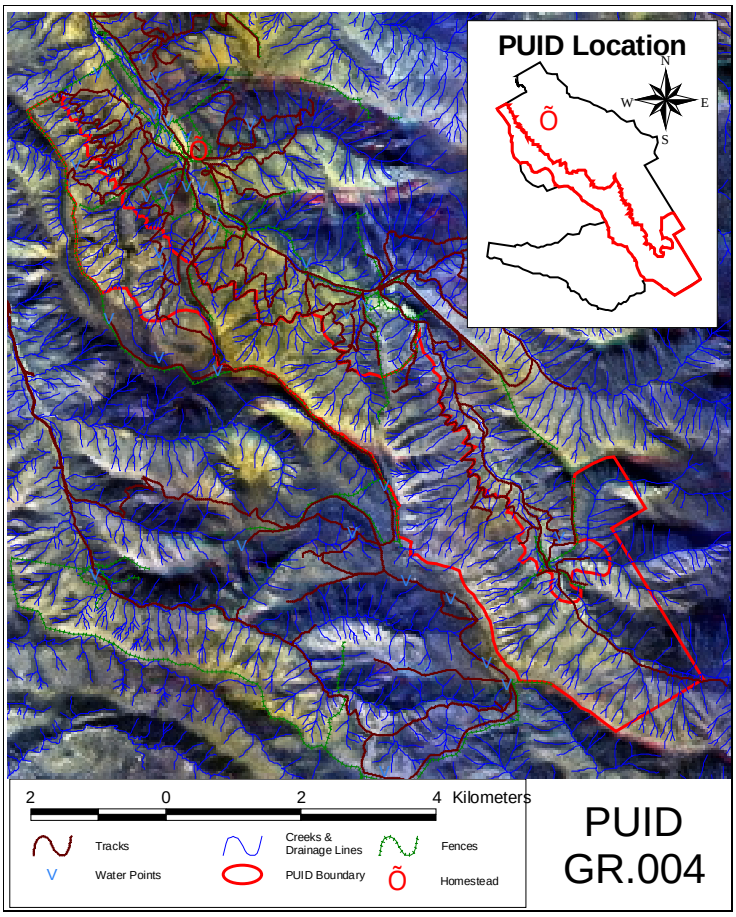


Table 3.2.5: Grazing Scores and Comments for PUID GR.004

	Raw Scores	Comment 1	Comment 2	Comment 3
Carrying Capacity	7	Wild oats country - very good grazing		
Herd Size	10			
Herd Composition	5			
Water	8	Water spaced out a bit	Stock have to walk a bit, steep country here	Couple of dams, some water in high gullies runs out of rock ledges
Mustering	3	Very steep, cattle will use it, but can't muster		
Fence Damage	7	Trees, storms, falling rocks, major risk, fire risk	Only a few couple of fences on it, rest escarpments	Access not too bad
Declared pests	6	Low tick numbers, lower worm counts	Lantana, little cock's spur	Mountain oak a problem - takes grass/shrubs like pine, but poisons ground
Infrastructure & Maintenance	10			
DNR Response Time	10			
Access Management	10			
Grazing Value	**5.66**	**Rescaled Rating**	**4.50**	

3.2.6 PUID GR.005

General description

Planning Unit GR.005 is situated along the upper reaches of the creek. It has been cleared to allow grazing but has shelter (trees) remaining. Permanent watering points are numerous along the creek. The PUID is well fenced and has a set of yards. PUID GR.005 is 230.5 Ha in area.

Figure 3.2.6: Planning Unit GR.005

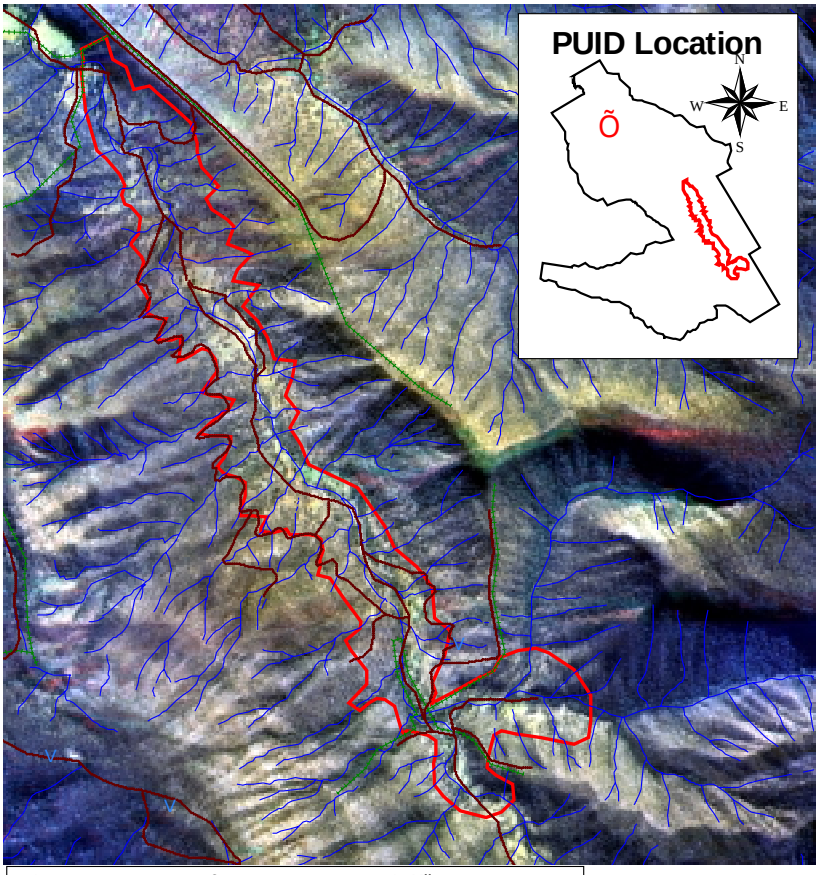


Table 3.2.6: Grazing Scores and Comments for PUID GR.005

	Raw Scores	Comment 2	Comment 2
Carrying Capacity	**7.5**	Less than 01b and 2	
Herd Size	**10**		
Herd Composition	**5**		
Water	**9**	Water flows all year round	
Mustering	**7.5**	Pretty easy, but some lantana thickets	
Fence Damage	**7**	Floods main risk factor	Access good, but rubbish in creek beds
Declared pests	**6**	Same as 002	
Infrastructure & Maintenance	**10**		
DNR Response Time	**10**		
Access Management	**10**		
Grazing Value	**7.22**	**Rescaled Rating**	**5.74**

3.2.7 PUID GR.006

General description

Planning Unit GR.006 is situated up a side-branch of the main creek. It has been moderately cleared to allow grazing. There are several permanent watering holes in the creek. PUID GR.006 is 177.5 Ha in area.

Figure 3.2.7: Planning Unit GR.006

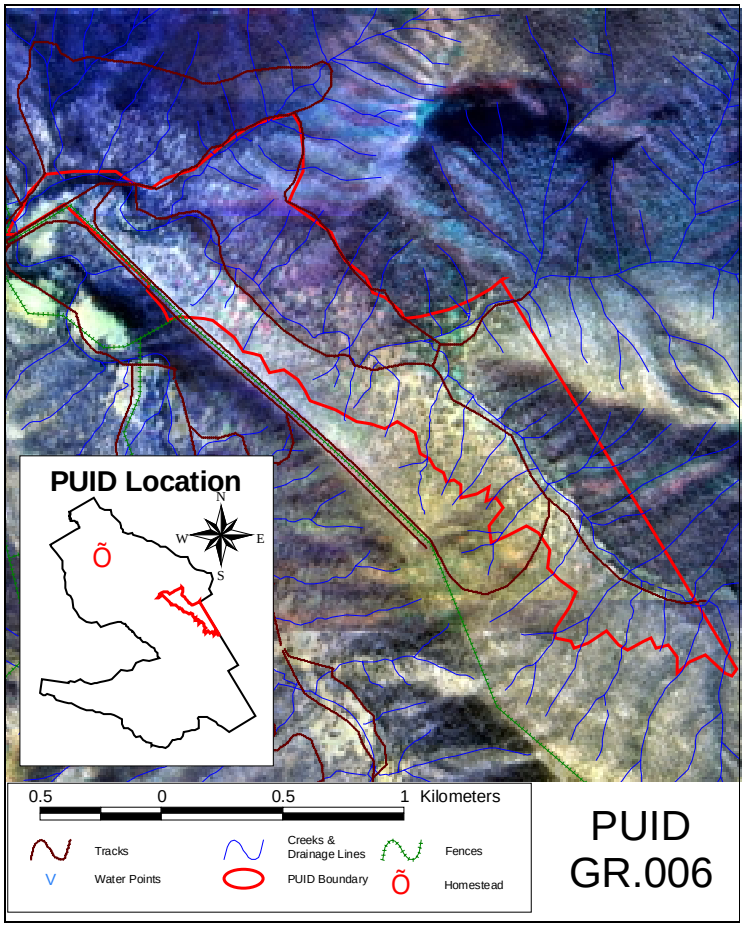


Table 3.2.7: Grazing Scores and Comments for PUID GR.006

	Raw Scores	Comment 1	Comment 2	Comment 3	Comment 4
Carrying Capacity	**9**	1 beast / 8 acres	Best creek flats and gentle undulating country		
Herd Size	**10**				
Herd Composition	**5**				
Water	**10**	Always water here, easy access to water from all points	Flaggy gets the most rainfall on the property		
Mustering	**7.5**	Get round ledge at top	Moderate country, but bit of lantana		
Fence Damage	**9**	No fences required, escarpments used	One fence in creek at main creek		
Declared pests	**6**	Crofton weed and lantana	She oaks in creeks a problem	Maybe a wild dog problem with cows and calves	Cf. main less lantana, more Crofton weed & morning mist
Infrastructure & Maintenance	**10**				
DNR Response Time	**10**				
Access Management	**10**				
Grazing Value	**7.84**	**Rescaled Rating**	**6.23**		

3.2.8 PUID GR.007

General description

Planning Unit GR.007 is comprised of some steep ridges and spur country. It has been very lightly cleared where accessible. There are only a few permanent watering points. PUID GR.007 is 303.7 Ha in area.

Figure 3.2.8: Planning Unit GR.007

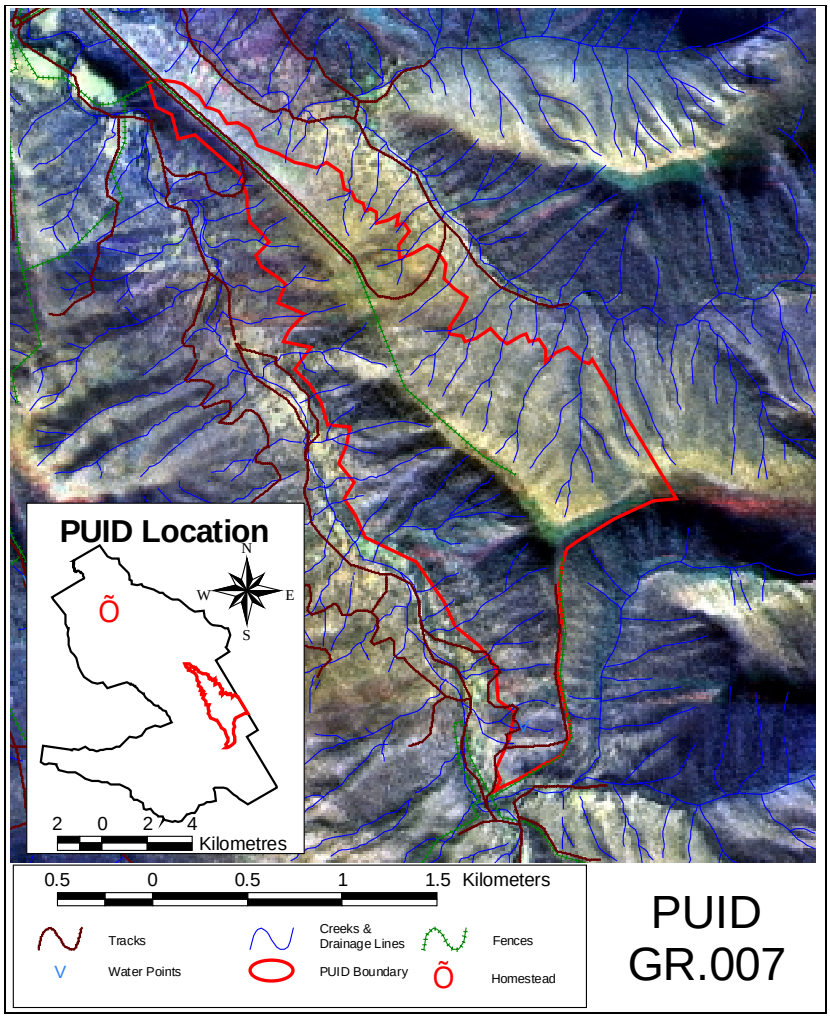


Table 3.2.8: Grazing Scores and Comments for PUID GR.007

	Raw Scores	Comment 1	Comment 2	Comment 3
Carrying Capacity	**7**	About 1/2 way between 01a & 01b		
Herd Size	**10**			
Herd Composition	**5**			
Water	**7.5**	Good water points and accessibility		
Mustering	**3.5**	Some areas are very difficult!	Horse defecates on the back of your neck when coming down!	Marginally better than Top Slopes
Fence Damage	**6**	Main risks = wind, storms, trees falling		
Declared pests	**6**	Bull oak + lantana	Wild dogs	
Infrastructure & Maintenance	**10**			
DNR Response Time	**10**			
Access Management	**10**			
Grazing Value	**5.69**	**Rescaled Rating**	**4.52**	

3.2.9 PUID GR.008

General description

Planning Unit GR.008 is comprised mainly of steep slopes. It is difficult to muster stock and has some watering points in the creeks and gullies. PUID GR.008 is 744.7 Ha in area.

Figure 3.2.9: Planning Unit GR.008

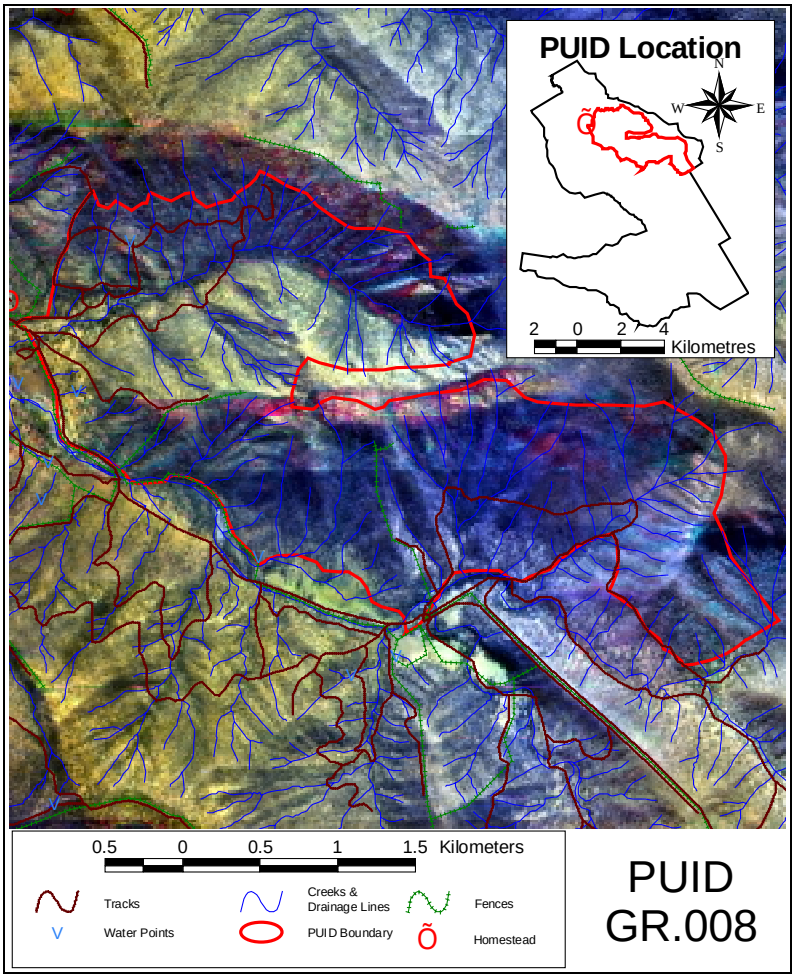


Table 3.2.9: Grazing Scores and Comments for PUID GR.008

	Raw Score	Comment 1	Comment 2	Comment 3	Comment 4
Carrying Capacity	**7**	Bit better than 01b			
Herd Size	**10**				
Herd Composition	**5**				
Water	**7**	Lot of gullies have water in fair season			
Mustering	**2**	Very steep, have to use horse	Have to scramble even on foot		
Fence Damage	**6.5**	Avalanche, fire, storms = main risks	Old dry fences	Access difficult if ground wet, not easy access to all areas.	Not a lot of fences
Declared pests	**2.5**	Lantana, mountain oak, pink mahogany	Pink box grows in gullies and smothers		
Infrastructure & Maintenance	**10**				
DNR Response Time	**10**				
Access Management	**10**				
Grazing Value	**4.96**	**Rescaled Rating**	**3.95**		

3.2.10 PUID GR.009

General description

Planning Unit GR.009 is comprised mainly of steep slopes and tablelands. It is very difficult to muster stock. There are several permanent watering points in some the creeks and gullies and the good pasture will fatten stock. PUID GR.009 is 265.3 Ha in area.

Figure 3.2.10: Planning Unit GR.009

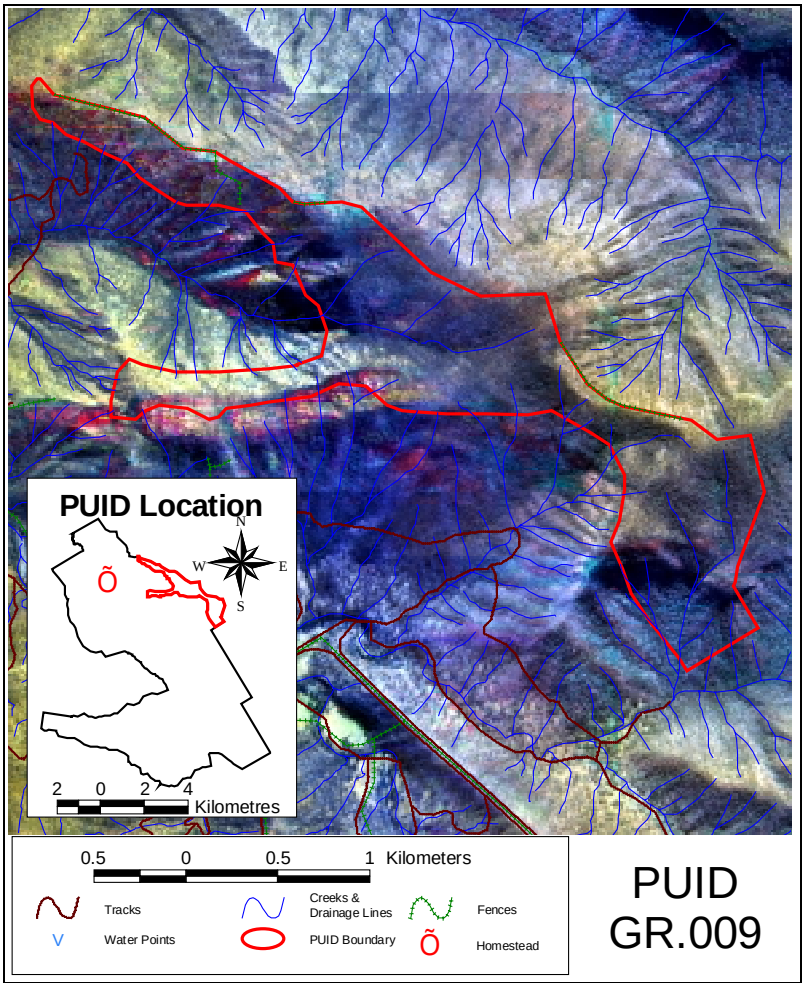


Table 3.2.10: Grazing Scores and Comments for PUID GR.009

	Raw Scores	Comment 1	Comment 2	Comment 3	Comment 4
Carrying Capacity	**7.5**	No cattle at present but will carry them	Blue grass, wild oats country	Ran about 30 head and left them there the time	Fattening country
Herd Size	**10**				
Herd Composition	**5**	Parasites not much problem on tablelands			
Water	**7.5**	Permanent water in Glen Rock gully			
Mustering	**2**	No fences between national park	Very difficult		
Fence Damage	**8**	No fences along boundary	Duffing not a problem, either here or on property	Escarpment used mainly	
Declared pests	**5**	No ticks, blady grass, pink box, mountain oak			
Infrastructure & Maintenance	**10**				
DNR Response Time	**10**				
Access Management	**10**				
Grazing Value	**5.6**	**Rescaled Rating**	**4.45**		

3.2.11 PUID GR.010

General description

Planning Unit GR.010 is comprised mainly of steep slopes and tablelands. The pasture is good quality. It is quite difficult to muster stock but yards are close by. There are only 3 dams, but there is usually some water in the creeks and gullies in all but the driest conditions. PUID GR.010 is 131.9 Ha in area.

Figure 3.2.11: Planning Unit GR.010

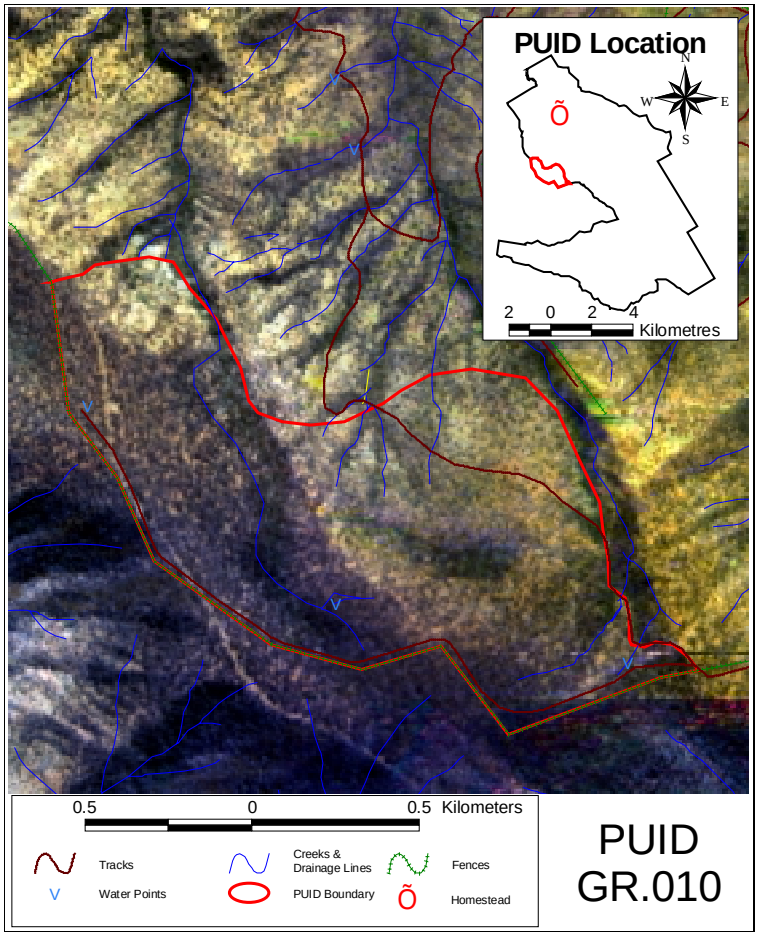


Table 3.2.11: Grazing Scores and Comments for PUID GR.010

	Raw Scores	Comment 1	Comment 2	Comment 3	Comment 4
Carrying Capacity	**8.5**	Like Flaggy but access not as good	Need to leave stock here for a while	Good wild oats grass	
Herd Size	**10**				
Herd Composition	**5**				
Water	**7**	Dams all full now so good water availability	Need to travel to head of gully to get to dam	Quite a bit less than Flaggy	Sweet creek water much better than dams
Mustering	**5**	Mustering is hard but don't often needed	Yards not too far away		
Fence Damage	**9**	Trees, storms are main risks	Bit better than creek flats paddock as no people and no floods	Good access can drive right along	
Declared pests	**6.5**	No tick and parasite problems	Wild dogs are a pest		
Infrastructure & Maintenance	**10**				
Response Time	**10**				
Access Management	**10**				
Grazing Value	**7.13**	**Rescaled Rating**	**5.66**		

3.2.12 PUID GR.011

General description

Planning Unit GR.011 is comprised mainly of tableland country. Wattle regrowth and bracken fern limit its use to graze cattle. There are only 2 dams. PUID GR.011 is 34.0 Ha in area.

Figure 3.2.12: Planning Unit GR.011

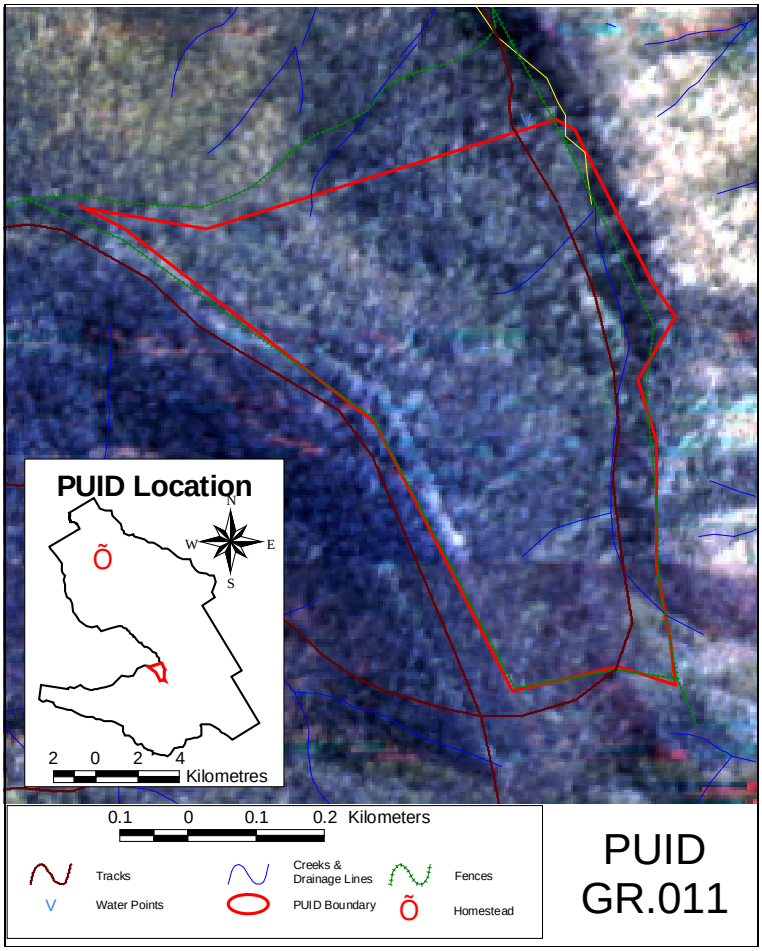


Table 3.2.12: Grazing Scores and Comments for PUID GR.011

	Raw Scores	Comment 2	Comment 2
Carrying Capacity	**5**	Very poor condition, black wattle, blady grass, regrowth, wild raspberry, bracken fern - all need cleaning up	Has potential - would be good as other good blocks if cleaned up
Herd Size	**10**		
Herd Composition	**5**		
Water	**7**	Massive permanent dam - yellowbelly	Dam water not as good as creek
Mustering	**7**	Only 200 acres, not too bad but long way to yards at bottom	
Fence Damage	**9**		
Declared pests	**6.5**	Same as Christies	
Infrastructure & Maintenance	**10**		
DNR Response Time	**10**		
Access Management	**10**		
Grazing Value	**6.41**	**Rescaled Rating**	**5.10**

3.2.13 PUID GR.012

General description

Planning Unit GR.012 is comprised mainly of some steep slopes and tableland country. Pasture is good but mustering can be a problem. PUID GR.012 is 789.7 Ha in area.

Figure 3.2.13: Planning Unit GR.012

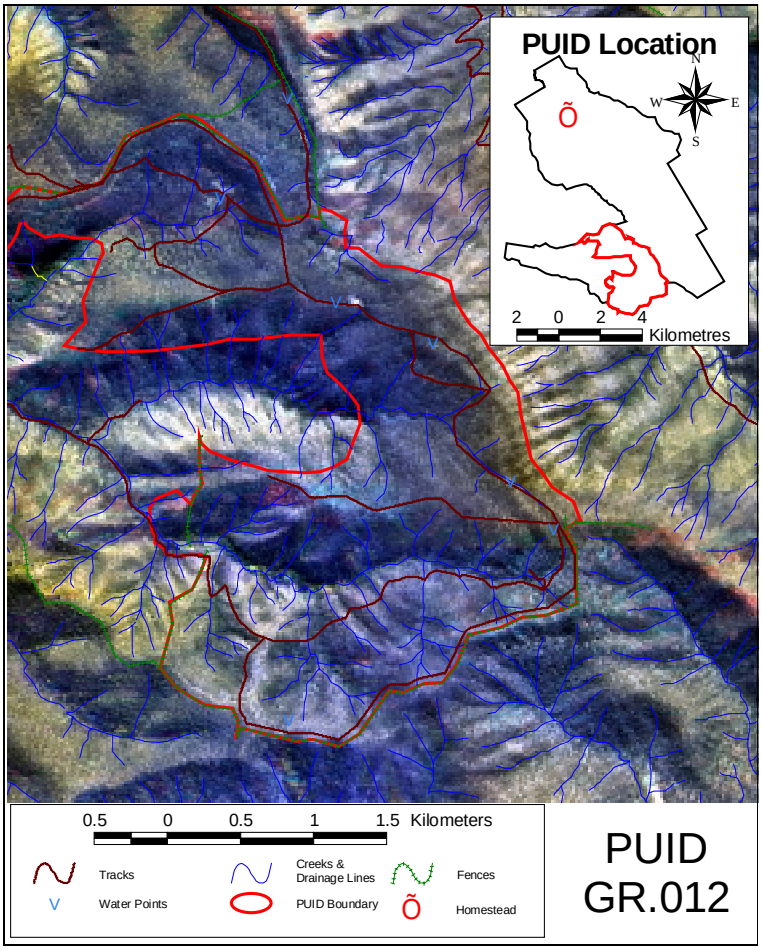


Table 3.2.13: Grazing Scores and Comments for PUID GR.012

	Raw Scores	Comment 1	Comment 2	Comment 3	Comment 4
Carrying Capacity	**9**	Bit better than Christies			
Herd Size	**10**				
Herd Composition	**5**				
Water	**7.5**	Plenty water still in dams at driest time of year	More water points than Christies		
Mustering	**6**	Large size and steepness detract from mustering	But once get stock onto track they're easy to get down	Bit better than Christies	
Fence Damage	**6.5**	Biggest risk from stock coming in from neighboring properties			
Declared pests	**5**	Minimal lantana	Wild dogs	Green wattle closing in	Illegal entry from Goomburra (moterbikers)
Infrastructure & Maintenance	**10**				
DNR Response Time	**10**				
Access Management	**10**				
Grazing Value	**7.20**	**Rescaled Rating**	**5.72**		

(On-site accommodation provided to workers based at Cook's Tableland – GR.012. Last used in the late 1970's.)

3.2.14 PUID GR.013

General description

Planning Unit GR.013 is comprised mainly of flats and moderate slopes with some steep slopes country. Water and mustering are limiting factors. PUID GR.013 is 824.8 Ha in area.

Figure 3.2.14: Planning Unit GR.013

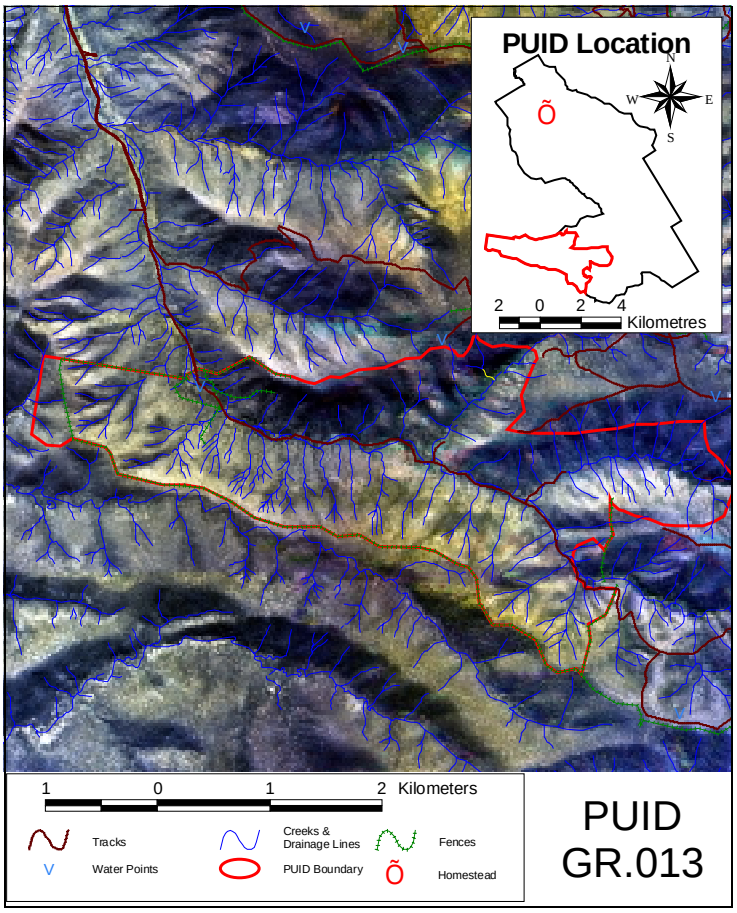


Table 3.2.14: Grazing Scores and Comments for PUID GR.013

	Raw Scores	Comment 1	Comment 2	Comment 3	Comment 4
Carrying Capacity	**7**	Similar to Top Slopes			
Herd Size	**10**				
Herd Composition	**5**				
Water	**3.5**	Worst water availability on property	Must get to creek		
Mustering	**2**	Steep but good roads (better than Top Slopes)	Very difficult		
Fence Damage	**5**	More difficult than Cook's Tableland	Worst fencing on property - difficult to build & Maintain and poor access		
Declared pests	**2.5**	Wild dogs, lantana	Wild raspberry grows over grazing	More lantana coming and frost doesn't get it	Bracken fern coming in
Infrastructure & Maintenance	**10**				
DNR Response Time	**10**				
Access Management	**10**				
Grazing Value	**4.71**	**Rescaled Rating**	**3.75**		

4. DISCUSSION

4.1 GENERAL

The model has been designed to work across all State forest grazing situations throughout Queensland. All criteria are scored on a 1 to 10 scale (with 10 being the best in the state) so all grazing values should then be relative to each other. For instance, a score of 5 for Atherton Tableland should be equivalent to a score of 5 at Dalby and a score of 5 at Gympie.

The Grazing Assessment Team was not happy to use this system as they had, collectively, most experience with grazing within South-east Queensland, and specifically within the surrounding district. So for the purposes of this study the Team elected to compare Glen Rock to properties within a 50 km radius. So a score of 10 for any criterion will mean this quality compares with the best within a distance of 50 km.

The grazing scores assessed by the Assessment Team have been rescaled to fit Glen Rock more accurately into the state wide grazing scale from 1 to 10. This was done by finding where the highest Glen Rock grazing score fitted in the state context and rescaling all other values to this new highest score. The following formula was used:

$$\text{Rescaled Score} = \frac{\text{New High Score}}{\text{Highest Original Score}} \times \text{Original Score}$$

The Rescaled Grazing Scores, together with the Original Scores, can be seen in Table 3.1.1. From this point on all Grazing Scores referred to will be the Rescaled scores.

Each PUID was rated for each of the Model Criteria described below. After discussion, 5 criteria were removed from the model's calculations as they were found not to apply in this specific situation. This was due mainly to the fact that the model was designed for forest grazing within State forests and timber reserves tenures, while the Glen Rock property has been managed as a freehold grazing property since it began.

Removal (or modification) of specific criteria was achieved by assigning these criteria a standard, agreed score. The effect of this, and the reasoning, is discussed for each relevant criterion below.

4.2 CRITERIA DETAILS

4.2.1 Carrying Capacity

Carrying Capacity can be defined briefly as the long-term average number of beasts that the PUID is able to carry given seasonal constraints. The Team were familiar with this measure of grazing quality and had no difficulties in assigning carrying capacity scores to each PUID that reflected that PUIDs quality within the district situation. As explained above, these scores reflect the quality of Glen Rock compared to properties within a 50 km radius.

Carrying capacity scores ranged between 5 and 10 and are presented in Figure 4.1. The higher carrying capacity scores follow the creek flats through the centre of the property and include Cook's Tableland.

4.2.2 Herd Size

This criterion is designed to measure the financial viability of the PUID. Within the State forest and Timber Reserve tenures, it provides a measure of reasonable financial returns expected from the number of beasts able to be grazed over a lease. The idea being that the lessee will be more inclined to maintain the PUID and lease on a sustainable basis if there is a adequate return from his effort and investment.

For Glen Rock, the Team decided that this factor was not relevant so it was removed from influencing the Grazing Value by assigning it the maximum rating of 10. That is, all PUIDs were scored at 10 for this criterion. Herd Size has not been included in Figure 4.1 for this reason.

4.2.3 Herd Composition

Herd Composition scores are a reflection of the type of animals generally grazed over the PUID. The PUID might be classified as; **I**. "good fattening country" and be rated highly; **II**. Suitable for a "mixed herd" and receive an average rating or **III**. Be used for "breeders or scrubbers" and get a low rating.

After some discussion, the Grazing Assessment Team came to the conclusion that in Glen Rock's case most of the paddocks and PUIDs were used for all three classifications at different times depending on the condition of the land and seasonal constraints. Because of this they decided to 'average' the Herd Composition at a rating of 5 for all PUIDs.

4.2.4 Water

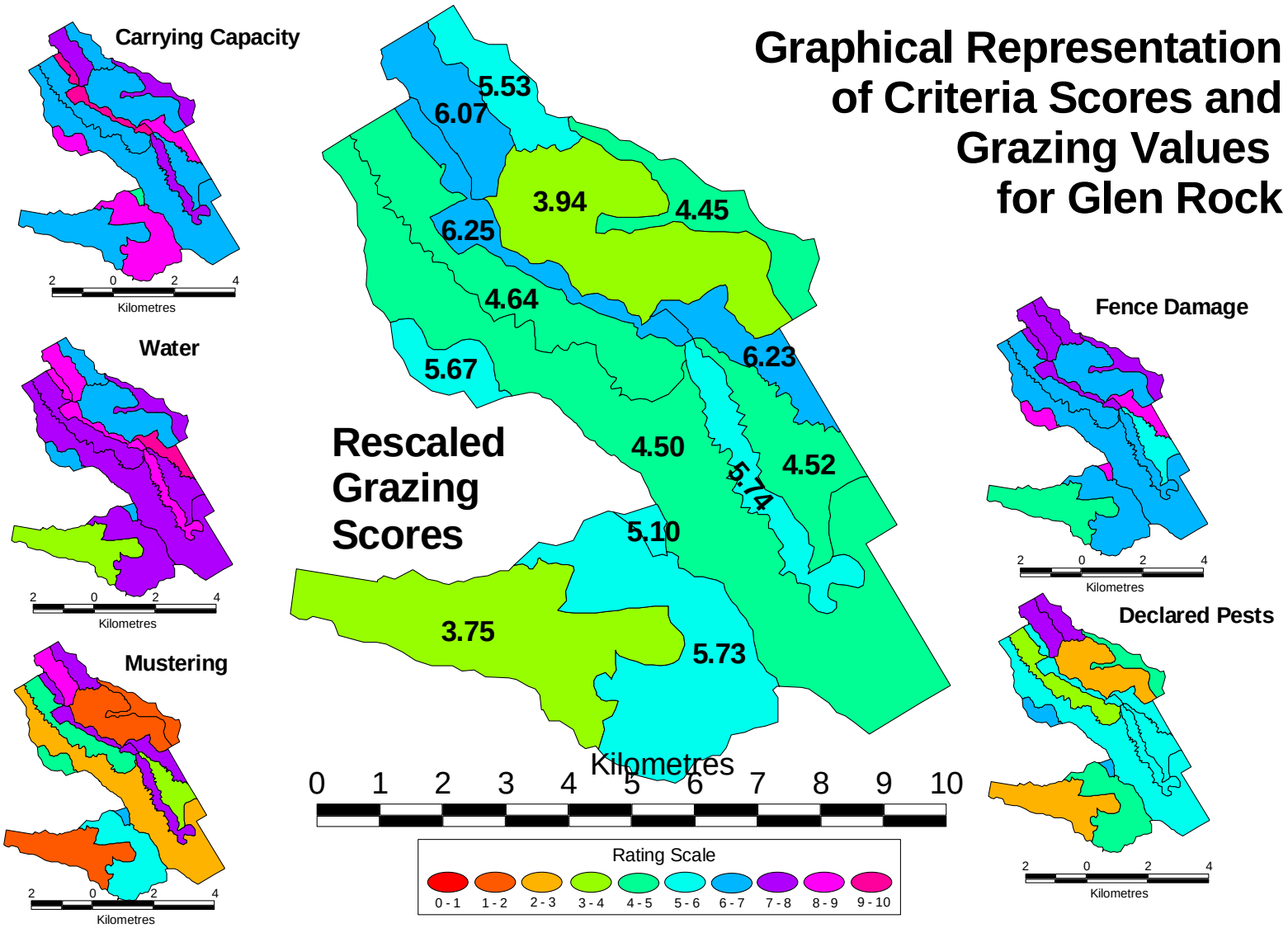
The Water criterion gives an assessment of the availability of water over the PUID in terms of access and quality. It assumes that an 'ideal' distance between water points is 4 km so that stock only need to walk 2 km to water from any point. However, it was noted that this is the situation for flat country. For steeper slopes this 'ideal' distance would reduce down to 1-1.25 km. (Refer to comment for Water in Table 3.2.2)

Figure 4.1 shows that the best Water ratings were given to the PUIDs containing the creeks that pass through the centre of the property.

4.2.5 Mustering

This criterion describes the difficulty of mustering in terms of steep terrain, undergrowth, watering points, access and ease of moving stock. Figure 4.1 shows that the PUIDs that scored highly are either close to the homestead or follow the creek systems. This is to be expected as these are the most developed areas.

Figure 4.1: Criteria (Raw) Scores and Overall Grazing Scores each PUID presented in 5-tiered relative scale.



4.2.6 Fence Damage

The Fence Damage rating was designed to try and measure the risk of damage to **a).** Fences from unauthorised vehicles and **b).** Third parties property from cattle escaping. However the Assessment Team redefined this for the Glen Rock situation to be:

"Risk of damage or un-planned movement of stock through (i) visitors to Glen Rock, (ii) trees falling over fences as a result of lighting, storms, floods and (iii) gates left open."

As a result of this definition, PUIDs closest to the Homestead and areas difficult for the public to access were rated highly (see Figure 4.1). PUIDs that rated lower tended to be further from the Homestead or where stock is difficult to contain if gates are left open.

4.2.7 Declared Pests

Declared Pests is a rating of the PUID according the prevalence of declared pests present and/or presence of toxic plants or animal pests. The declared pests component is to give a measure of control costs and ease of control that will be needed to treat the weeds. The toxic plants and animal pests component is to give a measure of suitability to carrying stock.

Most of the property scored highly for this criterion, that is had low declared weed, toxic plants and animal pests levels.

4.2.8 Infrastructure and Maintenance

This criterion rates that addition of fences, dams, roads, grazing, and other infrastructure to DNR's overall management aims. It was specifically designed to apply to State Forests and Timber Reserves. After discussion by the Assessment Team, it was decided that this factor was not applicable in this situation as the property had been a grazing property. So Infrastructure and Maintenance was rated at 10 for each PUID so it had no impact on the Grazing Score.

4.2.9 Response Time

Response Time gives a measure of the call-out time required to attend the site for an unplanned call-out. Although this factor could also apply to response time from the Homestead for grazing management issues, the Assessment Team decided it was not applicable for the same reasons mentioned above (4.2.9).

4.2.10 Access Management

Access Management is important to DNR as Custodial Officers need access in the normal course of their duties to grazing lease areas within State Forests and Timber Reserves. However, for the reasons mentioned above (4.2.8) the Assessment Team elected not to apply this criterion to Glen Rock.

4.2 GLEN ROCK GRAZING VALUES

The Rescaled Grazing Values calculated and displayed in Table 3.1.1 are usefully broken up in Figure 4.1 into the 5 categories shown in Table 4.2. Specific comments are listed in Section 3.2.

Table 4.2 Grazing Values within Glen Rock

Grazing Classification	Class Range	Area (Ha)	Percent of Total Area	PUIDs
Poor	0 - 1			
	1 - 2			
Below Average	2 - 3			
	3 - 4	1569	25%	013, 008
Average	4 - 5	2696	43%	009, 004, 007, 003
	5 - 6	1379	22%	011, 01b, 010, 012, 005
Above Average	6 - 7	636	10%	01a, 006, 002
	7 - 8			
Excellent	8 - 9			
	9 - 10			
	Totals	**6281**	**100%**	

Below Average Grazing Areas

PUIDs 008 and 013 are classified as "Below Average" and comprise 1,569 Ha. PUID 008 scored poorly for Mustering and Declared Pests. PUID 013 scored poorly for Water Availability, Mustering, Fence Damage and Declared Pests. (Refer to Table 3.1.1 and Figure 4.1)

Average Grazing Areas

The 9 PUIDs classified as "Average" make up 4,075 Ha of the property. Low – moderate scores for individual ratings of Carrying Capacity, Mustering, Fence Damage and Declared Pests pushed these PUIDs into the Average bracket. (Refer to Table 3.1.1 and Figure 4.1)

Above Average Grazing Areas

Three PUIDs totalling 636 Ha are listed in this category. These PUIDs tended to score well on all criteria. (Refer to Table 3.1.1 and Figure 4.1)

4.3 SUMMARY OF GRAZING VALUES

Compared to other properties in the State, Glen Rock can be described as:

- 25% is "Below Average"
- 65% is "Average"
- 10% is "Above Average"

The Assessment Team believed that it was very unusual for 10% of a grazing property of this size in this area to be in the "Above Average" category.

4.4 AREA WEIGHTED GRAZING VALUES FOR STANDARD PUID SET

The Management Team has developed a set of Standard PUIDs for Glen Rock. These are presented in Figure 4.4. The Grazing Assessment Teams Grazing Values have been converted from the Grazing PUID set into the Standard PUID Set. This was done by applying an area weighted calculation.

Figure 4.4 Area Weighted Grazing Values for the Standard PUID Set

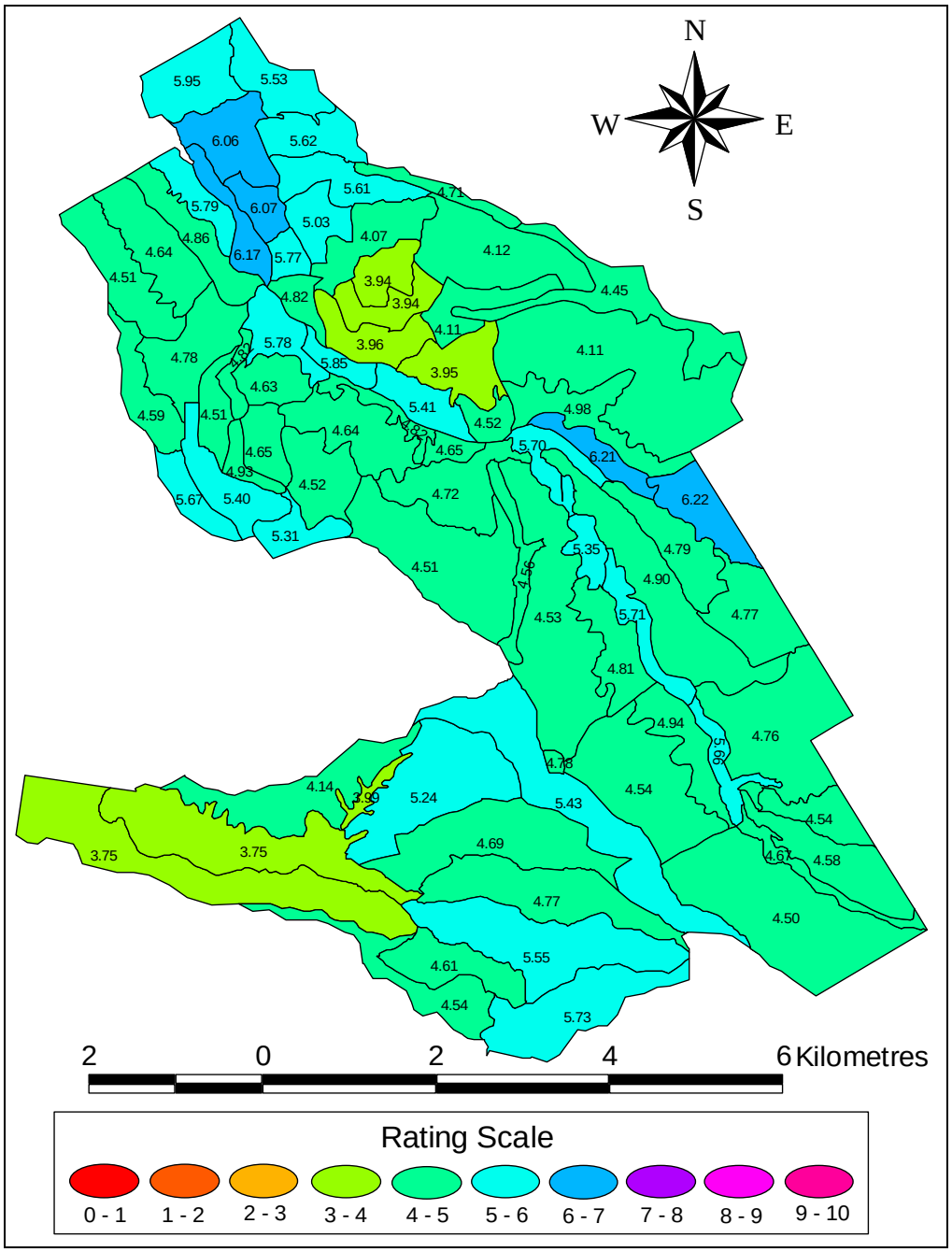


Table 4.4 Lists the Area Weighted Grazing Score for each PUID in the Standard PUID Set

PUID Number	Area Weighted Grazing Score
1	5.95
2	5.53
3	6.06
4	5.62
5	4.51
6	4.64
7	4.86
8	5.79
9	6.17
10	6.07
11	5.61
12	4.71
13	5.77
14	5.03
15	4.07
16	4.12
17	4.45
18	4.59
19	4.78
20	5.78
21	4.82
22	3.96
23	3.94
24	3.94
25	4.51
26	4.82
27	4.63
28	5.85
29	4.11
30	5.67
31	5.40
32	4.93
33	4.65
34	4.52
35	4.64
36	4.82
37	5.41
38	3.95
39	4.11
40	4.65

PUID Number	Area Weighted Grazing Score
41	4.52
42	4.98
43	5.31
44	4.51
45	4.72
46	4.56
47	4.53
48	5.70
49	4.90
50	6.21
51	5.35
52	4.79
53	6.22
54	4.81
55	5.71
56	4.77
57	4.14
58	3.99
59	5.24
60	5.43
61	4.78
62	4.54
63	4.94
64	5.66
65	4.76
66	3.75
67	3.75
68	4.69
69	4.50
70	4.67
71	4.58
72	4.54
73	4.77
74	4.54
75	4.61
76	5.55
77	5.73

4.5 RESOURCE ASSESSMENT TEAM MEETING – 9TH JANUARY 2001

Notes from the Grazing Assessment Meeting are included in Appendix 3.

The main objectives of this meeting were to (i). Gain consensus on rescaling the Grazing Scores from the local area to a State wide scale, and (ii). Confirm the facts and conclusions of the Draft Grazing Report.

After some discussion the Grazing Team decided that rescaling the previous highest score of 7.86 to 6.25 would accurately reflect where Glen Rock was situated in a State wide context. All the old grazing scores would be reduced in the same proportion to this new high score also.

These Rescaled Grazing Scores can be seen in Table 3.1.1 and are discussed more fully in Section 4.1.

Two other outcomes from this meeting were:

1. Concern that the conservative approach used in assessing the grazing potential might not be consistent across other uses and their assessments
2. Include a section in the report that identified where grazing has been found to enhance conservation management

4.5.1 Conservative Approach to Assessment

The objective of the Grazing Assessment Team was to assess the grazing potential of Glen Rock in a conservative and unbiased manner.

'Conservative' was taken to mean that grazing potential was assessed in the context of the property being managed for grazing in both a long-term and sustainable way. Due to the seasonal variability of the region, sustainable was taken to mean carrying sub-optimal stock numbers so poor conditions would not find the carrying capacity to high.

'Unbiased' refers to grazing being assessed in conjunction with, not to the exclusion of, other uses and activities. For example, during assessment inspections and discussions, if an area was known to be important to (say) picnicking, grazing for the area was assessed assuming that picnicking was also going to occur. That is, grazing may have been assessed with constraints that allowed picnicking (in this example). Any constraints noted will be included in Tables 3.1.2 to 3.1.14.

The concern of the Grazing Assessment Team was that grazing may have been scored lower compared to other uses if other Assessment Teams did not adopt a similar conservative and unbiased approach.

It is recognised that it will be difficult to determine if Assessment Teams are assessing use values on a similar scale. So ultimately it will be a matter for the Management Committee to decide in relation to these issues and make its decisions accordingly.

4.5.2 How Grazing Contributes to Conservation

The term "overgrazing" is almost always used with a negative connotation. No one would argue with this statement. But in these times, even the term "grazing" carries a lot of negative 'press.' The conservation movement has done its job well and educated us all to the damage possible through poorly managed grazing systems.

However, not all grazing is bad. Not all grazing causes vegetation communities to change sufficiently so that conservation and grazing objectives can no longer be met. No all grazing compromises the integrity of an area so that its environmental services fail.

Examples from around the world show that a planned approach to grazing can contribute positively to conservation objectives. The key factors in this positive partnership are that the grazing is actually planned to contribute to conservation or environmental goals, and that the correct policy and incentives are in place to allow landowners to make practical decisions.

Refer to Appendix 4 for a literature review on how grazing can contribute positively to conservation goals.

5. CONCLUSION/RECOMMENDATIONS

5.1 CONCLUDING STATEMENT

5.1.1 General

The Glen Rock property has been managed very conservatively for many years. This means that the natural resources have been well preserved and support a diverse range of habitats in good condition. It needs to be recognised that the conservation values associated with the property are as a result of the management practices, not in spite of them.

Against this background, grazing has not been seen to be a conflict for management options, but the prime reason for the management style. It appears that the long-term aim for property managers was to maintain a sufficient "natural" capital base to allow grazing to be sustainable over the long term and to account for seasonal fluctuations.

5.1.2 Results of this Study

This study has divided Glen Rock into 14 Planning Units (PUIDs) and has assessed the grazing value of each separate area. These are presented in Figure 4.1. There is a core area, defined as "Above Average" grazing that follows the main creek lines through the centre of the property. This would be expected as this area has been developed to the highest degree, is well fenced, has good access to water and is easily accessible from the Homestead.

A point to note is that the property has 75% of its area classified as "Average to Above Average" grazing country. The Assessment Team considered this remarkable for a property of this size in the district.

The Planning Management Team has divided Glen Rock into 77 PUIDs for planning purposes. The results of this study have been transferred from the 14 PUIDs defined by the Grazing Assessment Team into these 77 PUIDs as shown in Figure 4.4. An area-weighting calculation was used to determine the grazing score of each of the 77 PUIDs. This figure resembles Figure 4.1, except that the core areas of higher grazing value have 'leaked' into the surrounding PUIDs because of overlaps.

Section 3.2 contains all the relevant comments, PUID maps and raw criteria scores used in this assessment. They provide a useful background that illustrates how the grazing values of Figure 4.1 were obtained.

5.1.3 Conservation and Grazing

The Grazing Assessment Team has identified that the conservation values that exist now are a result, at least in part, of the conservative management of the property. This demonstrates that conservative grazing management is not necessarily in conflict with conservation issues. The Assessment Team considers that the continued conservative grazing management, when combined with a well-planned conservation strategy, would be even more effective in promoting conservation values.

5.1.4 Recreation and Grazing

Recreation was considered in this study not only in terms of inconvenience (i.e. gates that might be left open), but also in terms of how stock management might be altered to enhance people's recreation experiences. In some cases, this may involve moving stock off a particular area. In other instances, having stock present may actually enhance the recreational experience. Both of these situations would be taken on-board in future management decisions.

6. GLOSSARY

7.1 TERMS USED

Planning unit	A Planning Unit, or PUID, is a homogeneous area of land over which you would make the same management decisions. It is basically a 'bite-sized' chunk of similar country that you assess as a whole.
Grazing Model	A model developed by the Queensland Department of Natural Resources to assess the quality of grazing attributable to a specific reserve within the State forest and Timber Reserve estate. The model is designed to be a framework for the assessment process to facilitate accurate and repeatable assessments. The model is designed to provide values that are comparable across the State. The model exists as a computer spreadsheet to aid calculations.
Management Plan	(or Planning Process) See Appendix 1. This refers to the Management Planning Process developed by Queensland Department of Natural Resources. It is designed to include input from (i) the community; (ii) local and recognised experts within a framework of equity with regard to resources and the reserve in a local, district, regional, state, national and international context.
Model Criteria	Factors that need to be assessed at each planning unit and contribute to, or feed into, the model to derive the grazing value at this site.
Planning Management Team	A group of planners who facilitate the activity of the Resource Assessment Teams and ensure the timely flow of data to all groups.
Resource Assessment Team	(RAT) A group of nominated experts who can assess the grazing (in the case of this study) of the reserve within its regional and state-wide context.

7. BIBLIOGRAPHY

8.1 ARTICLES USED

Allies Creek State Forest Power Line Compensation Pilot Study – Draft for Discussion (Version 2.0), 2000, Queensland Department of Natural Resources – Forest Resources, PO BOX 2454, 4th Floor - Charlotte Chambers, 35 Charlotte Street, BRISBANE ALBERT STREET QLD 4001

Anderson, E.W., Franzen, D.L., Melland, J.E., 1990 "Forage Quality as Influenced by Prescribed Grazing" – in Can livestock be used as a Tool to Enhance Wildlife habitat? USDA Forest Service, General Technical Report RM194

Anon., 2000 Colorado Grazing Lands Conservation Initiative: Benefits for Urban and Rural Coloradoans, http://www.cascd.com

Anon. 1 The Conservationist's Proposal Fact Sheet http://nevadawilderness.org

Boyd, Charlotte with Roger Blench, David Bourn, Liz Drake and Peter Stevenson, 1999 Reconciling interests among wildlife, livestock and people in eastern Africa: A Sustainable Livelihoods Approach. Overseas Development Institute http://www.oneworld.org/odi/

EA (Environment Australia), 1998 National Strategy for the Conservation of Australia's Biological Diversity http://www.erin.gov.au/portfolio/esd/biodiv/strategy/chap2.html

EPA, 1999 Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Chapter 2: Management Measures for Agricultural Sources. http://www.epa.gov/OWOW/NPS/MMGI/Chapter2/ch2-2e.html

Forest Grazing Model (Version 3), 2000, Queensland Department of Natural Resources – Forest Resources, PO BOX 383, GYMPIE QLD 4570

Guthery, F.S., DeYoung, C.A., Bryant, F.C., & Drawe, D.L., 1990 "Using Short Duration Grazing to Accomplish Wildlife Habitat Objectives" – in Can livestock be used as a Tool to Enhance Wildlife habitat? USDA Forest Service, General Technical Report RM194

Kantrud, H.A., 1990 "Effects of Vegetation Manipulation on Breeding Waterfowl in Prairie Wetlands – A literature Review." – in Can livestock be used as a Tool to Enhance Wildlife habitat? USDA Forest Service, General Technical Report RM 194

Kie J.G. & Loft E.R, 1990 Using Livestock to Manage Wildlife Habitat: Some examples from California Annual Grassland and Wet meadow Communities – in Can livestock be used as a Tool to Enhance Wildlife habitat? USDA Forest Service, General Technical Report RM194

Leeson, Peter 1999 Senior Forester – Estates, Queensland Department of Natural Resources, North Coast District. Personal Communication

Morris, Ken 2000 Glen Rock Property Manager, Glen Rock Station, Mt. Sylvia Road, Junction View QLD 4343 Personal Communication

Printz, J,L., 1997 North Dakota's Conservation reserve program Grazing and Haying Project http://www.aginfonet.com/agricata/content/total_ranch_management/27.html

Sedivec, K.K., Messmer, T.A., Barker, W.T., Higgins, K.F., Hertel, D.R., 1990 "Nesting Success of Upland Nesting Waterfowl and Sharp tailed Grouse in Specialised Grazing Systems in Southcentral North Dakota" – in Can livestock be used as a Tool to Enhance Wildlife habitat? USDA Forest Service, General Technical Report RM194

Severson, K.E., 1990 Summary: Livestock Grazing as a Management Tool – in Can livestock be used as a Tool to Enhance Wildlife habitat? USDA Forest Service, General Technical Report RM194

Society for Conservation Biology, 1999 Communities Taking Charge – challenges and opportunities for public land management. http://conbio.net/scb/

Stock Grazing Manual, 2000, Queensland Department of Natural Resources – Forest Resources, http://csaweb.dnr.qld.gov.au/csaweb/DNR/services_dnr.html

Urness, P.J., 1990 Livestock as manipulators of Mule Deer Winter Habitats on Northern Utah – in Can livestock be used as a Tool to Enhance Wildlife habitat? USDA Forest Service, General Technical Report RM194

USDA, 1994 Healthy Grazing Lands – an American treasure, Grazing Lands Conservation Initiative

8. APPENDICIES

8.1 APPENDIX 1: THE 8 PHASES, AND INTERNAL CONSULTATIVE COMPONENTS, OF THE PLANNING PROCESS

PHASE	ACTIVITY	TARGET GROUP/PARTI-CIPANTS	OUTCOMES
Phase One (Steering)	Setting the scope of the planning exercise, establishing a Steering Committee and operational protocols. Identification of the range of potential stakeholders. The role of the Steering Committee is to manage the process, ensure accountability and equity and be the first step in the resolution of any frictions that may arise.	Agency / Community Leaders	• Identification of range of interests to be incorporated into the planning process • Suggested level of community and stakeholder participation
Phase Two (Methods)	Identify broad issues, anticipated plan area, the number of forest values to be assessed, site specific planning methodology and community engagement strategies including the type of interaction between participants and the information support system.	Planning Group (MUMP team)	• Anticipated planning area, site specific methodology and community engagement strategies.
Phase Three (Issue Identification)	Identification of specific issues relating to the plan area through both random (ads, flyers etc.) and targeted (direct contact with known interested parties) interaction with the community. Issue submissions are categorised spatially and thematically to aid interrogation and incorporation into decision making	• General Community • Specific Interest Groups	• Classification and prioritisation of issues to be resolved and conflicting interests to be reconciled
Phase Four (Interpretation and Extension of Methodology)	Introduction of the Planning Methodology to target groups and fostering an acceptance/consensus among likely participants. Modification of the process as necessary.	• Agency Leaders • General Community • Specific Interest Groups • Expert Groups	• Agreement relating to the methodology and delineation of planning unit boundaries

Phase Five (Analysis)	1. Collation of base line data sets from existing sources within the Department (eg GIS and Remote Sensing Layers, Data bases etc). Collection of site specific data through application of Forest Use Assessment Models. Participation of experts in the inventory of the resource characteristics of the plan area	Experts (Inventory)	• Base line inventory data • Data base of site and planning area specific information
	2. Participation of community representatives in the assessment of the generalised preferences that the community places on the range of forest uses relevant to the plan area. Community preferences or value indicators are separate from issues of inventory, compatibility of specific uses and management practices.	Targeted Individuals within:- • General Community • Specific Interest Groups	• Set of social preferences for the planning area. • Aggregated social preferences and site specific data sets to derive a classification of significance for each forest use in each planning unit
	3a. Using information gathered in Phase 5 Sections 1 and 2 compatibility between individual activities is assessed through the sequential analysis and mitigation of impacts. 3b. Analysis and response to issues. Issues identified in phase three are specifically addressed by the management team. 3c. Compilation of draft Plan. The notes of the management group generated while resolving incompatibilities and making allocation decisions form the substance of the management plan.	Experts (Management)	• Suite of compatible activities identified within and between planning units • Phase 3 issues addressed • Detailed rationale attached to each allocation decision • Draft Management Plan
Phase Six (Review)	Release of Draft for comment	• General Community • Specific Interest Groups	
Phase Seven (Finalisation)	Completion of the final Plan incorporating comments where appropriate. An appeal/ grievance/ complaint resolution process is necessary	Experts (Management)	• Refined Planning Outcomes
Phase Eight (Approval)	Approval and adoption of planning outcome	Agency Leaders	• Final Plan

8.2 APPENDIX 2: FOREST GRAZING MANUAL

Introduction:
A standard structure is needed for assessment of forest grazing values in State forests. This will assist management planning decisions as well as allowing comparison of grazing values between different areas.

This model is presented as a means of standardising the assessment of grazing values within Queensland State forests. It is designed as a framework for thinking to allow different groups in different areas to consider the same factors. Its aim is to allow comparison of grazing values from one area with grazing values in another.

The MUMP's Grazing Model (Version 3) is a Microsoft Excel spreadsheet based application. You are able to enter data directly into the spreadsheet, or the data can be recorded on the Grazing Proforma for entry into the spreadsheet at a later time.

This version is a simplification of previous versions. Feedback suggested some previous criteria were redundant. Also, the calculation formulae have been modified to better reflect the comments received from various grazing 'experts.'

Simply rate each of the criteria on a scale from 1 (low) to 10 (high) in each Planning Unit (PUID). Then enter these values into the appropriate cells in the spreadsheet. The overall grazing value will be calculated automatically for each PUID you have entered data for.

Explanation of Sections and Criteria:
The Grazing model is divided into 3 sections. Within each section are several criteria that ask questions relating to the potential grazing value of the area in question:

SECTION	DESCRIPTION
Carrying Capacity	A measure of how many animals the land can carry sustainably. The 3 criteria examine how many animals can be run on the area in question, the overall herd size relative to the minimum required for a viable enterprise and herd composition.
Stock Management	A measure of the ease or difficulty in managing stock on the area. The 4 criteria examine water availability, ease of mustering, likelihood of fence damage and the presence of declared plants.
DNR Mgmt Issues	A measurement of the positive and/or negative effects stock grazing has on DNR management activities and aims. The 3 criteria give an indication on how grazing will affect the Department's management in relation to (i). infrastructure and maintenance, (ii). call-outs/response time, and (iii). site access.

Each criterion within these 3 sections is weighted so that the most important, or influential, components have more of an impact on the end result. These weightings are discussed, along with the calculations, in the following section (Calculation of Values).

Carrying Capacity
There are 3 criteria in this section.

Criterion CC1	Carrying Capacity
Description	Refers to the number of cattle able to be grazed on the Planning Unit in terms of head per Ha. This should be taken as the long-term average number of cattle, given seasonal constraints. See comments below and descriptions in Note 1 to this Appendix.

		Rating	**Verbal example**
Examples	**High**	**10**	numbers of stock/Ha able to be grazed is on a par with the best in the State. (>1/5 ha)
	Med	**5**	average grazing numbers in a state-wide context. (1/10 to 1/15 ha)
	Low	**1**	very poor grazing numbers in a state-wide context. (< 1/26 ha)

Carrying capacities for various types of State forest. (See also Note 1 to this Appendix)

Rainfall Guide	**Native Forest Types**	**Grazing Capacities**
	Wallum/rainforest	nil
>750mm p.a.	tropical forest	1/25 ha plus
>750mm p.a.	well grassed and open forest	1/5 ha to 1/10 ha
>750mm p.a.	grassy open forest ridges and poorly grassed gullies	1/11 ha to 1/15 ha
500 – 750mm	poor open forest	1/16 ha to 1/25 ha
	very poor open forest	1/26 +ha plus

Criterion CC2	Herd Size
Description	How viable is grazing on this Planning Unit. Rate the Herd Size on its ability to support, or provide, an adequate income/return to the lessee. It is assumed that a lease that cannot provide an adequate return will not be maintained as well as one that can. If a lease will include several Planning Units, then rate Herd Size for all of the Planning Units as a whole and assign the collective rating to each planning unit. The size of the grazing area in relation to the length of fence is also important here. If the stock is confined to the grazing area by terrain, the lease may be viable given that fence maintenance will be very low.

		Rating	**Verbal example**
Examples	**High**	**10**	more than enough animals than needed to maintain a viable income; or low maintenance costs to keep stock in grazing area.
	Med	**5**	just enough head to justify maintenance on the lease/Planning Unit/s with respect to fence maintenance.
	Low	**1**	number of head able to be grazed is not viable due to either small size of lease, high fence maintenance costs, or both.

Criterion CC3	Herd Composition
Description	What type of animals can be supported on this lease? Is it good fattening country (10), mixed herd (5) or poor breeder/scrubber country (1)?

		Rating	Verbal example
Examples	**High**	**10**	good fattening country.
	Med	**5**	mixed herd.
	Low	**1**	poor breeder/scrubber country.

Stock Management:
There are 4 criteria in this section.

Criterion SM1	Water
Description	Rates the Planning Unit (PUID) on the number of permanent watering points. It is assumed that an ideal distance between watering points is 4 kilometres, ie. stock only have 2 kilometres to walk to water from any point. A Planning Unit that requires water to be trucked in, or dams constructed, would be rated low even if the water points are 2 km or less apart. This is to account for maintaining the State Forest in a 'natural' state without dams, troughs, wear and tear on roads, etc.

		Rating	Verbal example
Examples	**High**	**10**	plenty of permanent watering points, 4 km or less apart, spread over the PUID.
	Med	**5**	some permanent water points may be greater than 4 km apart; some may be temporary/seasonal water points.
	Low	**1**	very few or no permanent watering points, would require much effort/infrastructure to establish permanent water points.

Criterion SM2	Mustering
Description	Describes how difficult mustering will be over the PUID. How steep is the terrain, how thick is the mid/understorey or regrowth? If mustering would be very difficult but spear traps are used at water points, and this does not compromise DNR management aims and is common practice, the mustering score may be raised to reflect this, eg. from 2 without spear traps to 5 with spear traps (say).

		Rating	Verbal example
Examples	**High**	**10**	gently undulating to flat terrain, few rocks, sparse tree and shrub cover, excellent visibility.
	Med	**5**	some areas are steep and/or have thick tree or scrub cover, mustering is possible but difficult in some areas.
	Low	**1**	very steep, very thick bush. Mustering almost impossible except on foot.

Criterion SM3	Fence Damage
Description	What is the likelihood of damage to fences and stock by incursions of undesirable vehicles? Also include the risk, or impact, to other adjoining landerholders (and passers by) from stock getting out of the PUID.

		Rating	Verbal example
Examples	**High**	**10**	fences remote and/or not visited. Likelihood of damage, or impacts from escaped stock, very low.
	Med	**5**	moderate traffic, fence damage is possible/probable over the medium term. Damage from loose stock may cause some damage to crops or traffic.
	Low	**1**	high traffic/population area, fence damage very likely. High probability of crop or vehicle damage from loose stock.

Criterion SM4	Declared Pests
Description	Rate the PUID based on the number of declared pests present and the difficulty/cost of control. This assumes that the lessee will have to spend money/time to control these pests on the lease. Also include the presence of any toxic plants.

		Rating	Verbal example
Examples	**High**	**10**	nil or very few declared pests or toxic plants. Very low control costs.
	Med	**5**	some declared pests or toxic plants present that would require some control to minimise stock losses and maintain grazing. Moderate control costs.
	Low	**1**	large numbers of declared pests and/or toxic plants that would require heavy control to enable grazing. Very high control costs.

DNR Management Issues
There are 3 criteria in this section.

Criterion DMI1	Infrastructure & Maintenance
Description	This criterion rates the benefits, or otherwise, of fences, dams, stock yards, roads, watering troughs, etc. to DNR's management aims. Also includes impacts on other uses, eg. recreation.

		Rating	**Verbal example**
Examples	**High**	**10**	infrastructure will not conflict with DNR management aims and uses, or will be beneficial.
	Med	**5**	positive and negative impacts of infrastructure on DNR management and other uses balance each other out.
	Low	**1**	infrastructure has definite conflict with DNR management aims and will have strong negative impacts.

Criterion DMI2	Response Time
Description	Describes the time taken for DNR to respond to a call out from the nearest DNR office relative to other district activities and distances. Also includes the risk of being called out. A travel time of 2 hours is taken as extreme, but this is relevant to the District/Region.

		Rating	**Verbal example**
Examples	**High**	**10**	time to reach property is very short (20 min or less) and/or likelihood of being called out is very low.
	Med	**5**	travel time is about average for district and/or likelihood of being called out is moderate.
	Low	**1**	travel time to property is 2 hrs or greater and/or likelihood of being called out is very high.

Criterion DMI3	Access
Description	What impact will a grazing lease have on DNR's ability to manage access to this site? Accounts for Recreation and Education access, and other uses, that now must 'fit in' with grazing. (It is assumed that DNR will have no difficulty in gaining access to the site.)

		Rating	**Verbal example**
Examples	**High**	**10**	no difficulties with managing access to the site. Visitors can drive directly there.
	Med	**5**	moderate difficulties with access. Visitors must pick up key or similar.
	Low	**1**	definite difficulties with managing access to the site. Organising access is time consuming and on a case-by-case basis.

Calculation of Values:

General:
Overall, the Grazing Value is calculated in the following way:

$$\text{Weighted Average}\left(\text{Carrying Capacity} + \text{Stock Management}\right) * \text{DNR Management Issues} = \text{GRAZING VALUE} \quad \text{.....Equation 0}$$

However, there are weights involved with the Carrying Capacity and Stock Management sections as well as with each of the criteria. These, and the other calculations, will be explained below as each of these 4 components is described in detail.

A minimalist approach has been applied to constructing this model as much as possible. That is, the fewest number of criteria and the simplest relationship between these criteria, which accurately describe the grazing potential, have been used.

The performance of the model is deemed to be useful if it reflects the same grazing values that a panel of experts would have given for the same parcels of land. Here the aim is to get closer than 80% of the value of the expert panel. That is, the model values are within 20% of expert judgements 80% of the time.

Carrying Capacity:
The carrying capacity section is calculated using a weighted average of the 3 criteria:

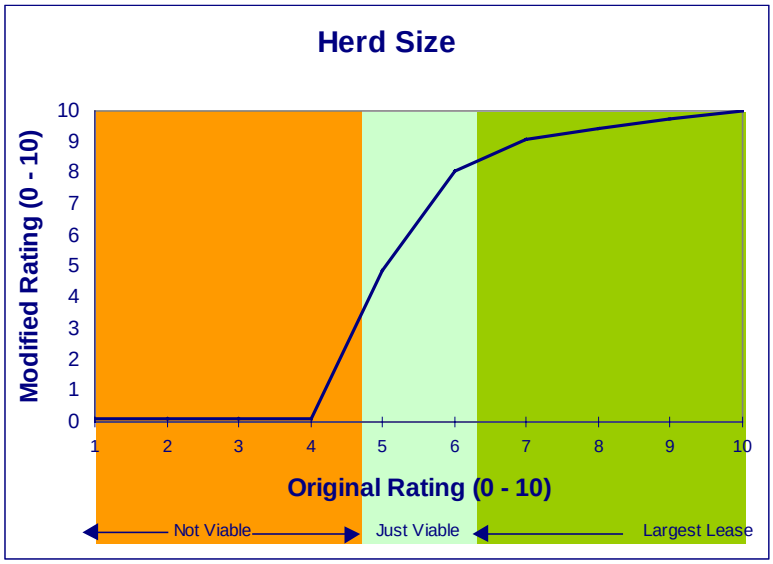
$$\text{Carrying Capacity Component} = \frac{CC * CC_{WT} + HS * HS_{WT} + HC * HC_{WT}}{(CC_{WT} + HS_{WT} + HC_{WT})} \quad \text{.....Equation 1}$$

where;

CC	=	carrying capacity estimate	(0 – 10)
HS	=	herd size estimate	(0 – 10)
HC	=	herd composition estimate	(0 – 10)
CC_{WT}	=	carrying capacity weight	(10)
HS_{WT}	=	herd size weight	(5)
HC_{WT}	=	herd composition weight	(10)

However, when considering these factors in the field in a practical sense, it appeared that herd size was the critical, or most sensitive, dynamic. Figure 1 (below) illustrates how the original rating is modified to reflect how important DNR sees the maintenance and upkeep of the forest estate.

App.2/Figure 1: Shows how the original Herd Size Rating is modified to reflect DNR's concern for viability and maintenance of a grazing lease.



What this graph is showing is that below a certain viable lease size (ie. below original rating of 5), DNR is concerned that there will not be sufficient income generated to maintain the lease in good condition. Below this level (less than 5) the modified herd size rating drops to zero.

Above an original rating of 5, the equation for the modified rating is:

$$\text{Modified Rating} = -0.0325*OR^4 + 1.0904*OR^3 - 13.663*OR^2 + 76.087*OR - 149.99 \quad \ldots\ldots \textit{Equation 1a}$$

where;

OR = Original Rating

Stock Management:
The stock management section is calculated using a weighted average of the 4 criteria. This is given by:

$$\text{Stock Management Component} = \frac{W * W_{WT} + M * M_{WT} + FD * FD_{WT} + DP * DP_{WT}}{W_{WT} + M_{WT} + FD_{WT} + DP_{WT}} \quad \text{.....Equation 2}$$

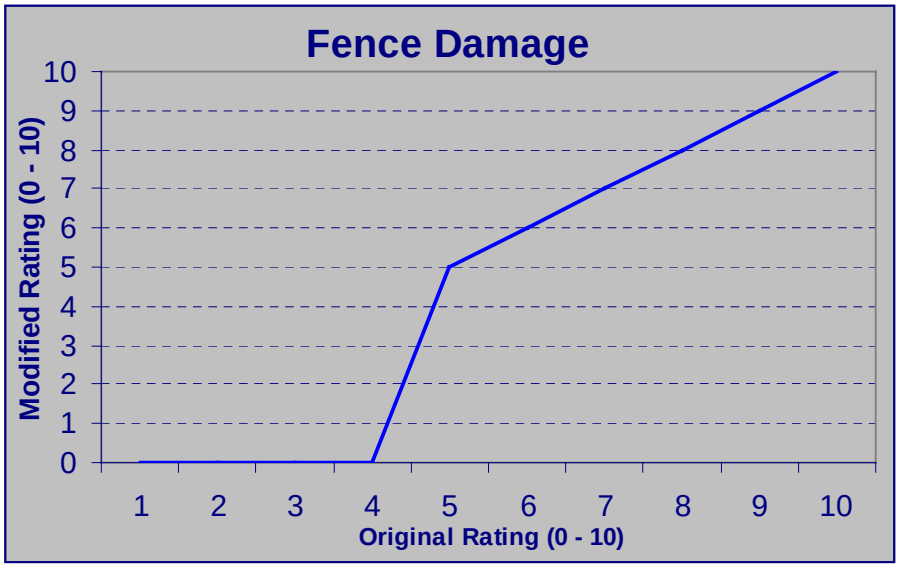
where:

W	=	water rating	(0 – 10)
M	=	mustering rating	(0 – 10)
FD	=	fence damage rating	(0 – 10)
DP	=	declared pests rating	(0 – 10)
WWT	=	water weight	(10)
M_{WT}	=	mustering weight	(10)
FD_{WT}	=	fence damage weight	(5)
DP_{WT}	=	declared pests weight	(5)

Three of the 4 criteria were considered critical in the sense that even if only one was critical, the stock management component would be reduced to a very low rating. The effect of these criteria (water, mustering, declared plants) was moved to the final Grazing Value calculation. This would allow the stock management section to reflect the raw ratings given to each of the criteria, while the Grazing Value score will reflect the full extent of any low ratings.

However, fence damage was adjusted (internally) to reflect this critical relationship. The relationship between the original and modified rating is shown in Figure 2.

App.2/Figure 2: The relationship between Original Rating and Modified Rating for the Fence Damage rating.



This relationship simply transforms any original rating below 5 into zero. Above 5, all modified values equal the original rating. This was considered adequate to penalise the Stock Management Section for the risk associated with stock escapes and potential damage likely to be caused.

DNR Management Issues:

The DNR Management Issues Section is calculated by taking the weighted average of the 3 criteria. The weighted average is then converted into a multiplier that has a range between 0 and 1. This multiplier is then multiplied by the sum of the Carrying Capacity Component and the Stock Management Component, as shown in Equation 0.

In the first instance, the DNR Management Issues Component is calculated by:

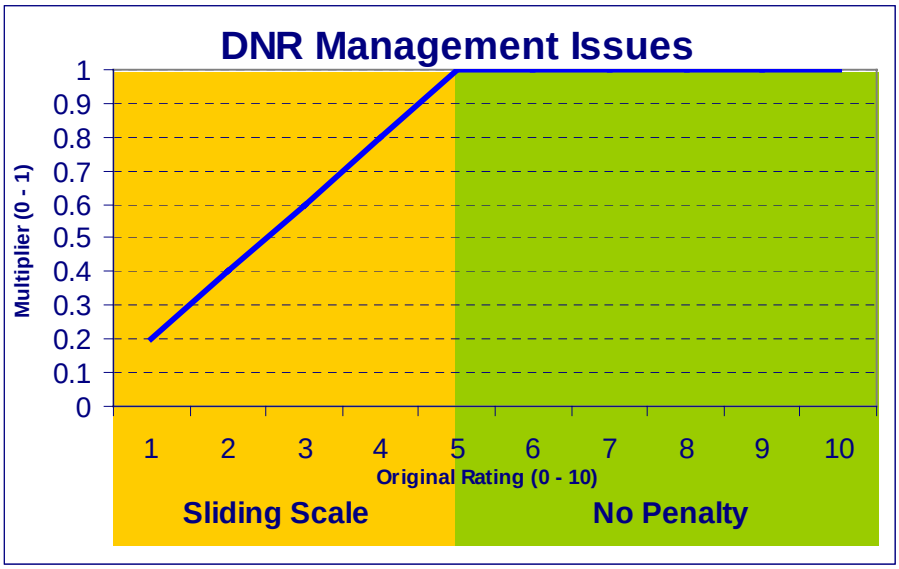
$$\text{DNR Management Issues Component} = \frac{IM * IM_{WT} + RT * RT_{WT} + A * A_{WT}}{IM_{WT} + RT_{WT} + A_{WT}} \quad \text{.....Equation 3}$$

where:

IM	=	infrastructure & maintenance	(0 – 10)
RT	=	response time	(0 – 10)
A	=	access	(0 – 10)
IM_{WT}	=	infra/maintenance weight	(3)
RT_{WT}	=	response time weight	(10)
A_{WT}	=	access weight	(3)

To convert this to a multiplier, it was considered that above a weighted average of 5, DNR would see no disadvantage from grazing, ie. all weighted average scores above 5 would be converted to a multiplier of 1. Below 5 DNR would be concerned that grazing would disadvantage its activities. In this case, it seemed that multiplying the weighted average by a factor of 0.2 would sufficiently penalise the grazing score. ie. the factor of 0.2 would apply only values from 0.1 to 4.9. Above 5, the multiplier would be 1. This relationship is shown in Figure 3.

App.2/Figure 3: The DNR multiplier derived from the weighted average of the 3 DNR Management Issues criteria.



Grazing Value:
The overall Grazing Value for the PUID is calculated by multiplying the weighted average of the Carrying Capacity and the Stock Management Components by the DNR Management Issues multiplier, but including some modifiers for Stock Management (see comments in section 2. above). This is shown in Equation 4 below.

$$\text{Grazing Value} = \frac{CC^{C} * CC^{C}_{WT} + (SM^{C} * SM^{C}_{WT} * Modifiers)}{CC^{C}_{WT} + SM^{C}_{WT}} * DNRMI \quad \text{.....Equation 4}$$

where:

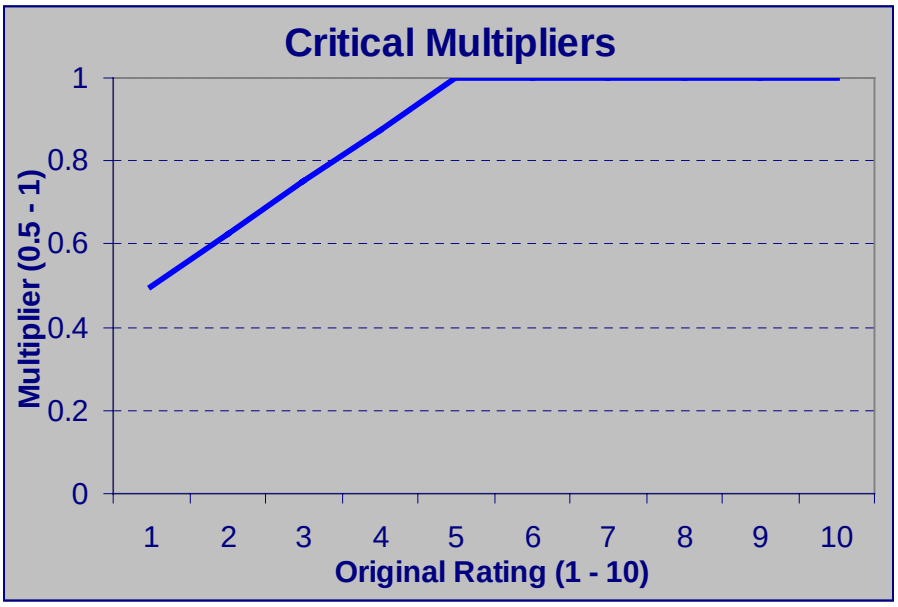
CC^{C}	=	carrying capacity component	(0 – 10)
SM^{C}	=	stock management component	(0 – 10)
DNRMI	=	DNR Management Issues multiplier	(0 – 1)
CC^{C}_{WT}	=	carrying capacity component weight	(20)
SM^{C}_{WT}	=	stock management component weight	(10)
Modifiers	=	conditions for water, mustering and declared pest qualities of the PUID	(0.5 – 1)

The modifiers were deemed to be necessary because if a single stock management criterion were at a critical level, it would severely reduce the overall value of the PUID for grazing. And if all 3 criteria were critical, they would work together to reduce the stock management component even more.

Each of the criteria is subjected to the same transformation that generates a multiplier between the values of 0.5 and 1. The formula used between 0 and 5 is shown in Equation 5 and is graphed in Figure 4.

$$\text{Multiplier} = 0.125 * \text{Criterion Rating} + 0.375 \quad \text{.....Equation 5}$$

App.2/Figure 4: Shows the transformation of Original Ratings to the Multiplier for the 3 Critical Stock management Criteria.



Conclusion:
The Grazing value, as calculated by the Grazing Model Ver 3, is given by the general formula:

$$\text{Weighted Average}\left(\text{Carrying Capacity} + \text{Stock Management}\right) * \text{DNR Management Issues} = \text{GRAZING VALUE} \quad \text{.....Equation 0}$$

Within this general formula, several specific modifications are included to account for variances observed in the field. These mathematical adaptations are described in the "Calculation of Values" section.

Figure 5 shows what Grazing Values are returned if all criteria are scored at the same value, ranging from all criteria = 1 to all criteria = 10. While this gives an indication of how the model performs, it does not capture the variations possible when each criteria behaves independently.

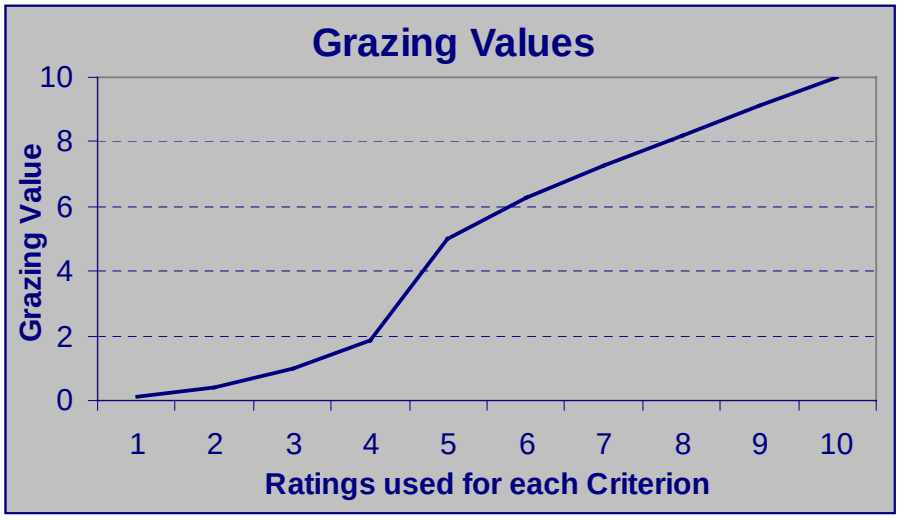
The Grazing Model has been used to assess forest grazing in the following State forests:

- Allies Creek (near Mundubbera)
- Braemar (near Dalby)
- Clements (north of Townsville)
- Brooyar (near Gympie)
- SF95 (near Gayndah)

To date the model seems to reflect the balance of 'expert' opinion. That is, no one has been 'upset' with the value the model returns compared with their judgement, or with the collective judgement of the group.

The model can also be adjusted to suit local conditions if they are different to the 'general' conditions the model was designed for. The next version of the model will include options to make such adjustments easier. It will also require documentation to justify any changes.

App.2/Figure 5: Shows the Grazing Value if each criteria in the model is rated at the same value ranging from 1, 2, 3,…..and so on to 10.



APPENDIX 2 – NOTE 1: Determination of Stock Carrying Capacity

These descriptions are from the Draft ***DNR Stock Grazing Permit Manual***, Feb 2000. Any specific details will need to be verified against the finalised manual.

Definitions:

- **Stock Carrying Capacity**. The average number of beasts that an area can support in an average year.

- **One Beast**. A beast is defined as a cow of breeding age or its equivalent (as detailed over)

CLASS OF CATTLE	Approx. Weight (kg)	ADULT EQUIVALENT
Mature Breeders	340-440	1.0
Breeder + calf to weaning	340-440	1.3
Weaning to yearling	150-220	0.4
Yearling to 2.5 year old (steer)	220-340	0.7
2.5 to 3.5 year old (steer)	340-450	1.0
Over 3.5 year old (bullock)	Over 450	1.2
Bulls	Over 450	1.3

- **Pasture types**. For the purpose of rental calculations two pasture types are recognised:

  "Improved Pasture" Sites. Those areas which have been sown t improved pastures e.g., cooch grass, kikuyu, legumes by other than the permittee while the improved pasture continues to be effective.

  "Standard" Sites. All areas which are not "improved" sites.

Note: Following canopy closure in some plantations, it is possible that most improved pasture species will disappear and in these cases, subject to the discretion of a Delegated Officer of the Corporation, it may be reasonable to re-classify the area from an improved pasture site to a standard site.

Guidelines for Determination of Stock Carrying Capacity:

Broad guidelines for the determination of stock carrying capacity are shown in Table 1 below. It may be necessary to vary the suggested stocking rates to suit local circumstances. In these cases, advice from local Department of Primary Industries Agriculture Industry Development staff should be sought.

When a set of stock carrying capacity tables are agreed to for a particular district, all officers should use these tables as their basis for their assessments. Any departure from this practice, together with reasons, should be clearly stated on the assessment form.

Appendix 2/Table 1 – Guidelines* for determination of Stock carrying Capacity

Plantation Age Class	Carrying Capacity Beasts**/ha/year	
Hoop Pine Plantations		
< 3 years	Not permitted	
3-5 years	1/1 ha to 1/4 ha	
6-10 years	1/5 ha to 1/10 ha	
11+ years	1/11 ha to 1/20 ha	
Exotic Pine Plantations		
< 3 years	Not permitted	
3-5 years	1/1 ha to 1/4 ha (improved pastures)	
3-5 years	1/5 ha to 1/10 ha (native pastures)	
6-10 years	1/11 ha to 1/15 ha	
11+ years	1/16 ha plus	
Native Forest Areas		
	Wallum/rainforest	nil
>750mm p.a.	tropical forest	1/25 ha plus
>750mm p.a.	well grassed and open forest	1/5 ha to 1/10 ha
>750mm p.a.	grassy open forest ridges and poorly grassed gullies	1/11 ha to 1/15 ha
500 – 750mm	poor open forest	1/16 ha to 1/25 ha
	very poor open forest	1/26 +ha plus

Notes: * Indicative only – consult local DPI Agriculture Development Industries staff and modify for District situation.

** A beast is defined as a cow of breeding age or its equivalent.

The following factors should be considered when determining stock carrying capacities:

- **Water**. Nominated stocking rates assume adequate water is available. When considering the water supply situation on a SGP, it is reasonable to take into account available water supplies on an adjoining parcel of land (including freehold) held by the permittee.

- **Average Conditions**. For the purpose of rental calculations, stock carrying capacity determinations should be based on average annual weather conditions, rather than abnormal seasonal conditions.

It is not necessary that an area be capable of carrying stock for the entire year before it can be included in rent calculations. For example, if an area could carry 60 beasts for only 4 months of the year, then the average annual stock carrying capacity of that area would be 20 head.

8.3 APPENDIX 3: 9. GRAZING R.A.T. MEETING

Grazing R.A.T. Meeting
Lockyer Catchment Centre
Forest Hill 9th January 2001

- Well managed grazing country will cater for conservation of native species
  - Food
  - Water
  - Shelter
  - Fire

- Grazing Team's assessment compared the management of GR with neighbouring properties within a 50k radius. Management of GR has produced a 10/10 when compared with some neighbouring management results.

- GR has wild oats areas in prime condition – there is not much of these areas left in good condition these days

- Consensus of team is that they must compare apples and apples i.e. GR is not necessarily comparable to dairy country (different cattle, different products, different markets)

- Inset 6.25 as top grazing score in GR ratings and scale other ratings to this maximum

- Grazing should be seen as a management tool that is used protect other uses and activities at Glen Rock

- Concern that while the grazing Team has used "common sense" conservative approach to grazing, other RAT's may have scored on a higher emotional basis. Grazing was scored on a conservative basis without trying to compare with, or highlight conflicts with, other uses. A cooperative approach was taken such that grazing and management decisions would be compatible with other uses.

- Is there a control booklet on Lantana that explains positives and negatives of control in different situations? This would be very useful.

- Contact Dr Bruce Alchin at UQ Gatton about Rangeland Impact of grazing and how this relates to grazing at Glen Rock. Insert Dr Alchin's research results into report to highlight positive grazing outcomes and send reports ton him when complete.

(G:\Resource Management\Forest Resources\Youngs Box\Word\MUMPS\Glen Rock\Grazing RAT Meeting 9 Jan 2001.doc)

8.4 APPENDIX 4: HOW GRAZING CONTRIBUTES TO CONSERVATION

How Grazing Contributes to Conservation - A Quick Literature Review

Andrew Young
January 2001

Introduction

Domestic and wild animals have coexisted for centuries in extensive systems around the world. In fact wildlife have benefited in many cases from the extra feed and protection afforded by modifications for the domesticated stock. Conflict arises when water and feed recourses become scarce or when suitable land is taken out of the extensive pasture systems for other purposes. (Boyd et. al., 1999)

The term "overgrazing" is almost always used with a negative connotation. One can conjure up mental images for overgrazing that include lots of thin scrawny beasts, dry dusty bare ground, lots of eroded gullies and sediment laden water courses. However, overgrazing can be more properly defined as, "altering the vegetative composition of a site by changing the proportions and kinds of grazing species." (Severson, 1990)

Using this definition of any alteration from the norm (natural), overgrazing applies to all grazed land. But overgrazing is a relative term. There is a range of changes along a continuum from the natural to the denuded to the weed infested. A conservatively grazed area may have only very slightly altered proportions of plant species, while a heavily grazed area may have a different species composition altogether. (Severson, 1990)

(Over) Grazing may be considered "bad" only if it causes a succession away from the management objective or if it compromises site integrity. (Severson, 1990) This implies a thorough understanding of successional and threshold processes.

(Over) Grazing modifies a sites naturalness by modifying:

1. Plant biomass
2. Structural components (e.g. height and cover)
3. Plant species composition

A good grazing management plan will have specific management objectives that try to manage these changes by controlling wildlife species of concern, timing of grazing, livestock. (Kie & Loft, 1990)

Full Accounting of Inputs and Outputs for Conservation and Grazing

Conservation is influenced in the main part by economics. There often needs to be some revenue derived from the land in question to fund its preservation. Sustainable income from conserved lands needs to be backed up, and based on, sound information bases. Conservative stocking rates appear to allow conservation and an adequate funding base to sustain conservation. (Printz, 1997)

In the Black Rock Conservation Area (Nevada), grazing will be allowed subject to constraints imposed from existing regulations. Allowing continued access for grazing ensures the necessary maintenance is provided for management purposes under the US Wilderness Act. (Anon. 1) Similar situations arise in grazing on Queensland State

forests. Grazing is permitted (or sought) so the graziers fences contribute to the overall management of the State forest where fencing construction is beyond the resources of the managing agency. (Leeson, 1999 Pers. Comm.)

Privately owned, healthy grazing lands provide (Anon., 2000; USDA, 1994):

- Habitat for wildlife
- Water for urban and other uses
- Visually appealing open space
- Reduced soil erosion and sedimentation
- Properly managed grazing lands help reduce greenhouse gas accumulation
- Renewable natural resource
- Higher quality of life
- Food for human consumption
- Increased recreational opportunities (camping, fishing, horse riding, bird watching, etc.)

Approximately 26.7% of all the land in the US is privately owned grazing land. But it is estimated that this land provides habitat for 2/3^{rds} of the wildlife in the US (due to higher productivity, etc.). (USDA, 1994) So the contribution of grazing systems to conservation needs to be recognised and included in conservation analysis.

Grazing Management Systems

The focus of any primary grazing management measures should be on the riparian zone. Some key options to consider when developing a conservative approach at a particular location include the development of one or more of the following (EPA, 1999):

- Grazing frequency (including periods of complete rest)
- Livestock stocking rates
- Livestock distribution
- Timing (season of forage use) and duration of each rest and grazing period
- Livestock kind and class
- Forage use allocation for livestock and wildlife
- Proper water and salt supplement facilities
- Livestock access control
- Range or pasture rehabilitation

A comprehensive grazing management system that encompasses these items should reduce physical disturbance to susceptible areas and reduce the release of sediment, animal waste, nutrients, and chemicals to surface waters. (EPA, 1999)

It has been found that herbage production is greater for managed grazing (e.g. above) versus continuous grazing; greater for moderate versus heavy intensity grazing, and greater for light versus moderate-intensity grazing. (EPA, 1999) A logical statement certainly, but the key is in the management of the system.

An example of a grazing management system is shown in a pasture study in Oregon where 90 cows without supplemented water spent a daily average of 25.6 minutes per cow in the stream. For the 60 cows that were provided a supplemented water tank, the average daily time in the stream was 1.6 minutes per cow, while 11.6 minutes were spent at the water tank. Based on this study, the authors expect that decreased time spent in the stream will decrease bacterial loading from the cows. (EPA, 1999)

Proper Grazing Use

Proper grazing use can be defined as "grazing at an intensity that will maintain enough cover to protect the soil and maintain or improve the quantity and quality of desirable vegetation." Increased vegetation slows runoff, acts as a filter for sediments and sediment attached substances, uses more nutrients, and reduces raindrop splash. (EPA, 1999)

Proper woodland grazing is similar to the above description except it is applied to timbered areas. It is defined as "grazing wooded areas at an intensity that will maintain adequate cover for soil protection and maintain or improve the quantity and quality of trees and forage vegetation." This practice is applicable on wooded areas producing a significant amount of forage that can be harvested without damage to other values. In these areas there should be no detrimental effects on the quality of surface and ground water. Any time this practice is applied there must be a detailed management and grazing plan. (EPA, 1999)

Short Duration Grazing (SDG) – Planned Grazing

Short duration grazing (SDG), or cell grazing, can be used to apply pressure on pastures to make them more suitable for specific species. For example, species that are inhibited ground cover that is either too tall or too dense. (Guthery *et al*., 1990) SDG has grazing periods of 1 – 5 days with typically 30 – 60 day recovery periods. Intense stocking rates for short periods over smaller pastures have tended to generate a more uniform grazing pressure. It has been found that as stocking densities increase cattle become more selective. It seems that the cattle have to be selective at higher stocking rates in order to compete with each other for the available food.

Other benefits from SDG may include (Guthery *et al*., 1990):

- Improved water penetration from hoof action of increased numbers on smaller areas
- Improved establishment of grass seedlings for same reasons
- Reversal of desertification by improving succession of different species

However, these benefits may depend on management decisions and the duration of the SDG system.

Planned grazing systems can produce benefits for wildlife in the following ways (Anderson *et al*., 1990):

- Stock may be able to advantageously manipulate standing biomasses of vegetation in the subsequent season
- Stock grazing can be used to influence the timing of a particular growth stage of specific vegetative species to suit dependant wildlife
- Planned grazing has been used to improve vegetation cover in degraded areas
- Stock numbers may help in diluting the number of native species in question available to predation

Australian National Policy

Using grazing systems, as outlined above, to contribute to conservation protection goals falls under Objective 2.2 of the National Strategy for the Conservation of Australia's Biological Diversity. (EA, 1998) Objective 2.1 outlines the need for opportunity costs of development activities to be accounted for to allow public interest to be assessed

fully. This point was covered in the Section entitled “Full Accounting of Inputs and Outputs for Conservation and Grazing” above.

In the National Strategy, landholders, other land managers, governments and industry organisations are encouraged to protect biological diversity by:

(a) Developing and adopting practical and acceptable codes of practice that acknowledge the need for change in management techniques
(b) Incorporating biological diversity conservation objectives in whole farm or property management, bioregional and catchment planning, including:

- The management of pests and weeds
- Identifying and managing critical biological diversity areas, including refuge areas, riparian vegetation, nutrient patches in semi-arid regions, habitat remnants on farmlands, watercourses and stock routes
- Reducing the impacts of sedimentation and nutrient and other chemical applications on freshwater, wetland and marine biological diversity
- Incorporating the risks of climate variability in property management to enhance the long-term sustainability and productivity of the environmental resource base, as reflected in the National Drought Policy
- Monitoring rangeland condition and adjusting management practices as appropriate

(c) Managing irrigation practices to encourage efficient use of water and minimise waterlogging, salinisation and other adverse effects on biological diversity
(d) Incorporating biological diversity conservation objectives in tree planting and other activities carried out for soil conservation and productivity maintenance and restoration purposes

Applying a management conservation system using these principles will ensure production is maximised within framework designed to maximise conservation.

Grazing Management: Contributors and Ethics

Socially balanced blends of contributors usually substantially improve a society’s ability to improve environmental conditions. (Society for Conservation Biology, 1999) This is especially so when local residents who are affected by decisions are included. It is clear that we have reached a new frontier in land management where cooperation, not dissemination and dictation, are the rules. Community based coalitions are able to focus on solving ecological problems and maintaining the economic base of the community when appropriate scientific input is provided.

Conflicts and competition concerning land use and access to water have intensified as demographic pressure on productive lands and international concerns for the conservation of biological diversity have increased. This is as true for the Australian situation as wildlife, livestock and people in the rangelands of eastern Africa. (Boyd et. al., 1999)

Conservation Instruments

Conservation instruments have evolved from both pragmatic and ethical bases. These have been lacking in practical machinery as can be seen by the generally poor performance of conservation agencies to stop wildlife decline using protectionism, exclusion and policing. Research is also pointing to the fact that conservation islands

(resulting from these policies) surrounded by wildlife deserts are not sustainable. (Boyd et. al., 1999)

An example of countering this problem is in assigning livestock grazing lands to areas around a conservation area. In effect the wildlife now has a greater effective area to use than the protected area alone. (Boyd et. al., 1999)

Evaluating conservation successes is a problem because the measures used are often in inappropriate or irrelevant units. Conservationists tend to evaluate success in ecological and environmental terms (e.g. area of habitat protected from degradation). Social-development specialists tend to use socio-economic criteria (e.g. reduced conflicts over natural resources, improved access to resources, new activities for income generation). Both types of evaluations tend to aggregate costs and benefits, and neither succeeds in capturing the indirect as well as direct impacts on rural livelihoods, distribution of impacts between different groups, and the prerequisites for engagement in certain activities. (Boyd *et. al*., 1999)

Boyd *et. al*. (1999) suggest a sustainable livelihood approach at the household to determine true conservation sustainability. Household well-being in eastern Africa is assessed in terms of food security, income generation, improved assets, reduced vulnerability and sustainable use of environmental services. It includes interactions between wildlife and livestock/agriculture as described below:

- Food security should improve at the household level as livestock now have access to reserve areas as well as wildlife to livestock areas.

- Income should increase, or at lease remain level, as non-destructive use of wildlife, e.g. tourism, increases. Income from agricultural activities may decrease as a result of wildlife-livestock interactions.

- When local custodianship of wildlife is strengthened, landholders will make management decisions that favour the wildlife species. Their decisions are now based on the higher value of their assets. They will also make decisions that limit negative interactions between livestock and wildlife.

- The advantages of a more diverse income stream may be offset by higher risk. Risks include tourism markets as well as competition for water and pasture access in drought conditions.

- This combined use system should use resources in ways that the environment has developed to sustain.

However, local conditions and available markets may not always be suitable to allow this system to work. Also, social benefits may not always equate to specific household benefits (or losses).

Specific Examples of Planned Grazing contributing to Conservation

Waterfowl and grouse prefer Planned Grazing Systems in North Dakota in terms of nesting sites, ground cover and food availability. (Sedivec *et al*., 1990)

Habitat in prairie wetlands has been manipulated by both fire and grazing to promote breeding success of waterfowl. (Kantrud, 1990)

Planned Grazing Systems applications have been used to manipulate ground cover to help ground dwelling bird populations. (Guthery *et al*., 1990)

In a Planned Grazing Systems study in Texas, rabbits and smaller rodents were favoured by the SDG system. In the same way, Planned Grazing Systems were beneficial to bird species richness of grassland birds in coastal Texas. (Guthery *et al*., 1990)

On annual grassland habitats in California, planned grazing has been found to maintain the balance between species and structural composition. This modification has benefited several species of native grazers. (Kie & Loft, 1990)

Mule deer took full advantage of improved carrying capacities of land primarily developed for livestock. The deer populations even became "excessive," passing their pre-settlement population numbers. (Urness, 1990)

On the Glen Rock property, observations suggest that the rock wallaby populations actively seek out pastures modified for grazing cattle. They have also be seen grazing along-side the stock – perhaps using the presence of the cattle to act as a deterrent for predators. (Morris Pers. Com., 2000)

Conclusions

The term "overgrazing" is almost always used with a negative connotation. No one would argue with this statement. But in these times, even the term "grazing" carries a lot of negative 'press.' The conservation movement has done its job well and educated us all to the damage possible through poorly managed grazing systems.

However, not all grazing is bad. Not all grazing causes vegetation communities to change sufficiently so that conservation and grazing objectives can no longer be met. No all grazing compromises the integrity of an area so that its environmental services fail.

Examples from around the world show that a planned approach to grazing can contribute positively to conservation objectives. The key factors in this positive partnership are that the grazing is actually planned to contribute to conservation or environmental goals, and that the correct policy and incentives are in place to allow