

A Summary of Research Conducted in the Barkly Region

(1947-2010)



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LOCATION INDEX

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39, 48, 75	Alroy Station
75	Anthony Lagoon Station
49	Argadargada Station
10	Austral Downs Station
3, 7, 12	Avon Downs Station
12	Benmarra Station
11, 18	Brunchilly Station
4, 5, 48, 75	Brunette Downs Station
71	Connells Lagoon
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69	Georgina River Catchment
15	Hayfield Station
12, 23, 30, 36, 44, 46, 52, 56	Helen Springs Station
8, 9	Lake Nash Station
2, 13, 19, 24	McArthur River Station
48, 56	Mittebah Station
28, 34	Murray Downs Station
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62	Powell Creek Station
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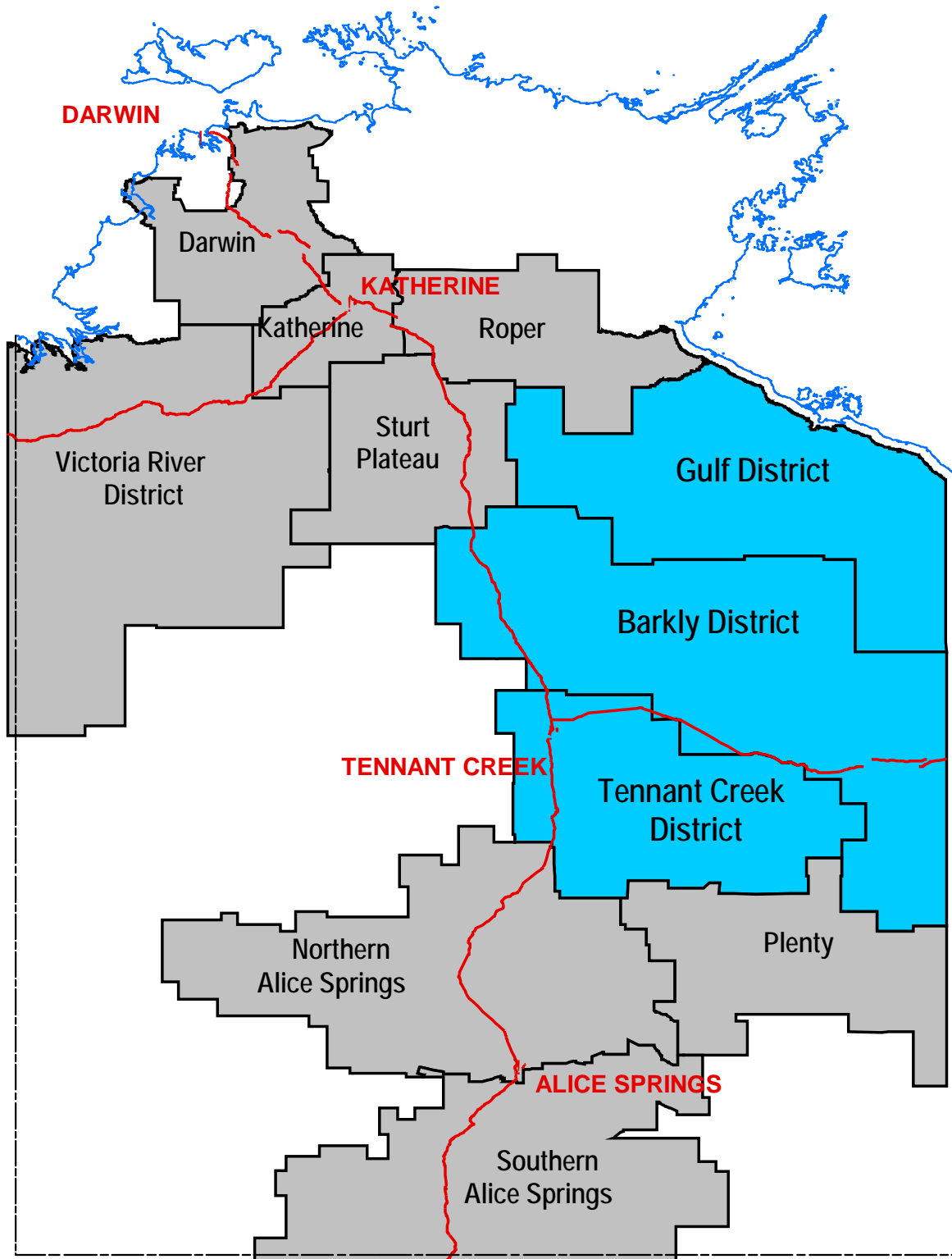


Figure 1. Map of the NT showing the Barkly Region which consists of the Gulf, Barkly (Tableland) and Tennant Creek districts

Throughout this document there will be several references to both 'districts' and 'regions'. The Barkly Region of the Northern Territory (NT) can be divided into three main districts: the Gulf district to the north, the Tennant Creek district in the south and the Barkly district, also known as the Barkly Tableland, in between. In cases where a district or region is referred to rather than an individual station, the research project has been conducted on a number of stations, sometimes covering more than one district. Figure 1 outlines the three districts that comprise the Barkly region.

SUMMARY

The members of the Barkly Research and Advisory Committee (BRAC) recognised the need to document the research work previously conducted in primary industry in the Barkly Region. Research work conducted by the Department of Resources (DoR), the Department of Lands and Planning (DLP), CSIRO, the Barkly Landcare and Conservation Association, the Bushfire Council of the NT and industry groups will be included.

The aim of this Technical Bulletin is to provide an easily accessible list of the research work carried out in the Barkly Region, some of which dates as far back as 1947. This publication will aid future researchers and stakeholders, allowing them to benefit from previous knowledge and experience within the region.

Over 80 projects relating to the pastoral industry are summarised in this document; topics are grouped under 12 headings to facilitate easy navigation. Where possible, reports for the projects have been cited in the form of Technotes, Technical Annual Reports and Technical Bulletins. Many of these have been made available through DoR's website at www.nt.gov.au/d. Hard copies of all stated documents are available from DoR's office in Tennant Creek.

During the years covered by this publication, the NT department responsible for primary industries has gone through several changes to its structure and its name. Recent names include the Departments of Primary Production; Primary Industry and Fisheries; Primary Industry, Fisheries and Mines; Business, Industry and Resource Development; Regional Development, Primary Industry, Fisheries and Resources; and, currently DoR.

Similar changes have occurred in the NT department responsible for conservation and the environment. Recent names include the Conservation Commission of the NT (CCNT), DLP, Natural Resources, Environment and the Arts (DNRETA) and currently Natural Resources, Environment the Arts and Sport (DNRETAS). In this publication, the current department names have been used, except when a previous department name is part of a reference citation. A full list of acronyms is available at the end of the document.

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To find out more information on any topic included in this publication, or obtain a copy of documents listed, please contact Pastoral Production Officers, DoR, Tennant Creek, NT on (08) 8999 5511.

REPRODUCTION

1. Reproductive Performance of Beef Cattle

Project Officer: L. Andrews (JCU)
Location: Barkly Region and various locations throughout the NT
Date: 1976

Summary: The reproductive efficiency of beef cattle was studied over a three year period on a number of properties in the NT. Herds were assessed twice yearly and data on age, body condition, pregnancy, lactation status, and clinical and reproductive abnormalities was recorded for further analysis. In all districts, conception patterns followed rainfall patterns with a lag of approximately one month. Conception rates appeared depressed in the inland areas during summer due to the adverse effects of high ambient temperatures. Brucellosis and trichomoniasis contributed to reproductive wastage, while vaccinations against vibriosis helped to increase pregnancy rates by up to 8%. The outcomes of this study led to recommendations that management should use appropriate methods of vaccination, testing and handling of weaners to create disease-free herds. Maintaining separate disease-free herds would enable gradual removal of the original base herd containing chronically diseased animals.

Document Location: L. Andrews (1976). Reproductive Performance of Beef Cattle in the Northern Territory. (Thesis: James Cook University).

Keywords: reproductive efficiency, conception rates, disease

2. Production Parameters of Brahman-cross Cattle in the NT Gulf over Five Years

Project Officers: T. Schlink (CSIRO Tropical Animal Science Division)
M. Carpenter (DoR)
S. Coutts (McArthur River station)
Location: McArthur River Station
Date: 1984-90

Summary: CSIRO and DoR worked cooperatively on a project designed to achieve specified heifer weight for age targets and improve reproduction rates. Two paddocks with similar land types were allocated, each carrying approximately 200 females and 7% (14) bulls. At initial stocking, all cattle were weighed. Blood, saliva and liver samples were collected from a selection of cattle prior to being released into the paddocks. The control herd was not supplemented, while the treatment herd in a separate paddock was supplemented for two years. Preliminary observations indicated serious nutritional problems and it was envisaged that the production targets set at the commencement of the program would be difficult to achieve with the available pasture and feed resources. The trial did not demonstrate a significant difference in fertility, mortality or weight changes between the two groups, but there were useful reproductive parameters defined as a result of this study.

Document Location: Final Report DoR Library, Tennant Creek.

Preliminary Report, Appendix 11. Collaborated Research Project
CSIRO/DPP/Colinta on Pasture Management and Animal Production.
Schlink, A. C., Carpenter, M. and Brown, A. (1994). Productivity of a *Bos indicus* cross cattle herd in the western gulf region of the Northern Territory.
Proceedings of the Australian Society of Animal Production, **20**: 93-96.

Keywords: reproduction, supplement, fertility

3. Maiden Heifer Trial

Project Officers: J. Stefani and D. Savage (DoR)

Location: Avon Downs Station

Date: 1987–89

Summary: This project was set up to establish the correct mating time and critical mating weight for young *Bos indicus* breeding cattle on Mitchell-Flinders grass pastures of the Barkly Region. In 1989, the project was abandoned due to irregular seasonal conditions. There were also some limitations or constraints on the trial, the major one being the run of poor seasons with a lack of quality and quantity of feed. With the heifers in poor condition in 1989, it was decided not to conduct pregnancy tests or weight records, to avoid additional stress. As a consequence, an analysis was performed on the trial as a whole, rather than on annual performance. The results obtained in 1987-88 indicated that the critical mating weight lay in the range of 320–340 kg, which resulted in the greatest number of pregnant heifers. Branding percentages in this controlled mating trial were 59% in 1998 and 61% in 1989. These branding percentages compared favourably with a group of heifers of the same age and from the same line of cows in an uncontrolled mating situation, with branding percentages for the corresponding years being 44% and 51%, respectively. These figures indicated that larger numbers of offspring were produced by controlled mating. In summary, for the three years, 82% of the heifers were pregnant and reared a calf at some stage, with 11% failing to be pregnant or rear a calf. Heifer mortality was 6.6%.

Performance of heifers in weight classes	Under 320 kg	Over 320 kg
	%	%
Heifers to achieve pregnancy	80	95
Heifers to have calved	60	75
Heifers to have calved and back in calf	3	8
Heifers yet to calf	40	25
Heifers yet to conceive	20	5
Heifers to have lost calf	10	16

Document Location: Technical Annual Report 1989-90 (Page 55-58)

Keywords: *Bos indicus*, controlled mating

4. Controlled and Uncontrolled Mating

Project Officer: J. Stefani (DoR)
Location: Brunette Downs Station
Date: 1988–91

Summary: This demonstration investigated the potential of controlled mating to improve productivity of *Bos indicus* cattle on the Barkly. No significant differences in conception rates or branding rates were detected between the controlled mating and uncontrolled mating groups. There was, however, a significant difference in the heifer mortality rate over the three years: 2% in the controlled herd and 8% in the uncontrolled herd. These results demonstrated the advantages of controlled mating so as to time calving to coincide with peak nutritional availability. The calf is then able to be weaned by mid dry season, reducing stress on the cow in the late dry season and consequently cow mortality. In the controlled mating herd, 85% of the conceptions occurred within the first four months of the joining period in each year compared with 68% in the uncontrolled herd. Findings of this trial also supported the theory that conception rates increase with increased live-weight.

Document Location: Technical Annual Report 1989-90 (Page 53-54).

Keywords: controlled mating, heifer mortality, conception rates

5. GnRF Field Trials – Hormonal Spaying

Project Officers: M. Carpenter and J. Stefani (DoR)
Location: Brunette Downs Station
Date: 1989

Summary: This trial was designed to demonstrate the efficacy of a vaccine against the gonadotrophin releasing factor (GnRF). GnRF stimulates output of gonadotrophin which, in turn, stimulates ovulation. The vaccine is designed to prevent cull female cows from becoming pregnant for a period of six months post-parturition. Field trials were conducted on commercial properties, designed specifically to provide data for registration of the product in the NT. The results of the trial showed that although the vaccine did not provide 100% protection against pregnancy, significant control could be achieved.

Document Location: Technical Annual Report 1989-1990 (Page 54-55).

Keywords: gonadotrophin releasing factor (GnRF), ovulation

6. Production Parameters of a Barkly Breeding Herd

Project Officer: A. Brown (DoR)
Location: Newcastle Waters Station
Date: 1991-95

Summary: This study was conducted in order to demonstrate the current state of production in Barkly Tableland herds. Observations were collected on the performance of Brahman breeders from four single-sire herds of 40 breeders. These herds were managed in a similar way to commercial herds with first and second round musters, and weaning down to five months (150 kg live-weight). The performance of these Brahman breeders, ranging in age from two to 10 years, was compared with British breed cattle between 1967 and 1971 (Andrews, 1976); an ongoing study of calving patterns on Mt Sanford in the Victoria River District (MacDonald et al. 1997); a study on Brahman breeders in the Gulf district during 1986-1990 (Brown et al. 1994).

The overall conception rate in the Brahman herd was 84% and the calving rate was 76%. Most breeders conceived from December to June, but there was a spike in October consistent with a response to second round weaning (81% of October 'pregnancy tested in calf' cows were wet at the muster August to September). A significant increase in the rate of conception in response to weaning was observed in October 1991, September 1992 and June 1994. Gross figures showed that 2% of calves were lost between calving and weaning. The average inter-conception interval (ICI) was 14.3 months. The percentage conceiving within three months of calving was 32% and a further 48% conceived four to six months after calving. A 14.3 month ICI is equivalent to the annual conception rate of 84%. The calving rate was 76%, with wastage of 8% attributed to abortions and losses around calving. The ICI of two-year-olds was two weeks longer than that of the herd average. Analysis showed April and May conceptions (January to February calving) to be 1.5 times more likely to produce a 12 month ICI than at any other time of the year.

Document Location: Technote No. 100. (1998). Production Parameters of a Barkly Breeding Herd. <http://www.nt.gov.au/d/Content/File/p/Technote/TN100.pdf>
Technical Annual Report 1997-98 (Page 114-116).
Andrews, L. (1976). Reproductive Performance of Beef Cattle in the NT. (Masters Thesis, James Cook University).
MacDonald, N. et al. (1997). Mt Sanford Project Pasture Trends and Calving Patterns 1993-1996, DoR Report 97/1 NT.
Brown, A. T., Schlink, A. and Carpenter, M. (1994). Production Parameters of Brahman Cross Cattle in the Gulf Area of the NT over Five Years. Technical Bulletin No. 217, DoR.

Keywords: Brahman, conception rates, inter-conception interval (ICI)

7. Avon Downs Seasonal Calving Study

Project Officers: D. Savage, A. Doust, M. Adams and M. Hearnden (DoR)
S. Hagan (AACo)
Location: Avon Downs Station
Date: 1996-2002

Summary: This project aimed to monitor the reproductive performance and associated variables in a group of replacement breeders on native pasture on the Barkly. A herd of approximately 1000 Santa Gertrudis maiden heifers was used for the trial. Heifers which conceived between January and March achieved a higher reconception rate six months after their estimated start of calving, than heifers which became pregnant in April to June. Analysis of the data showed that a body condition score of 5.5 (on a 0 - 9 scale) or above resulted in improved conception rates. Results also indicated that lactating over the dry season severely depletes animal body reserves with average condition scores decreasing as the dry season progressed. It was also found that the number of pregnancies per month was strongly related to rainfall patterns. The need to synchronise conception with rainfall is particularly relevant in regions such as the Barkly, where annual pasture quality is highly dependent on timing of rainfall.

Document Location: Technical Annual Report 1997-98 (*Page 111-113*).
Technical Annual Report 2001-02 (*Page 73-77*).
Avon Downs Indicator Herd Project (McCullochs Paddock) Final Report.
Savage, D., Hearnden, M., Doust, A., Hagan, S. and Adams, M. (2003). The conception pattern of a Santa Gertrudis herd continually exposed to bulls over 6 years. *Recent Advances in Animal Nutrition in Australia*, **14**: 2003.

Keywords: native pasture, Santa Gertrudis, conception rates

8. Reproductive Disease Surveillance

Project Officer: A. Brown (DoR)
S. Jephcott (Stanbroke Pastoral Company)
Location: Lake Nash Station
Date: 1999-2002

Summary: The study assessed the serological evidence of common endemic diseases in breeding cows on the Barkly and measured the association between periods of seroconversion with abortion, delayed conception and calf loss. One hundred breeding cows were sampled for evidence of known diseases, which could cause reproductive loss. Results indicated that seroconversions to akabane virus were significantly associated with reproductive loss in the study. The study also found that transmission was very effective with high herd numbers indicating presence of bovine viral diarrhoea (BVD) and infectious bovine rhinotracheitis (IBR). A strong presence of vibriosis was also found in bulls in the herd.

Document Location: Brown, A. and Jephcott, S. (2002). Reproductive Disease Surveillance on a Barkly Tableland (NT) Property.
DoR Library, Tennant Creek.

Keywords: endemic disease, akabane virus, bovine viral diarrhoea (BVD), infectious bovine rhinotracheitis (IBR), vibriosis

9. Breeder Herd Efficiency: Lake Nash

Project Officers: D. Savage and A. Doust (DoR)
R. Jansen and S. Jephcott (Stanbroke Pastoral Company)
Location: Lake Nash Station
Date: 2000-02

Summary: Three herds were investigated: an unsupplemented control group; a herd that received wet season supplement only; and a herd that received wet and dry supplement. Herd efficiency values were derived from kg progeny sold/kg cows mated. A disease investigation was also carried out as part of this study (see project: 'Reproductive Disease Surveillance'). Pasture samples were collected and analysed for phosphorus, nitrogen and digestibility to provide estimates of nutrient deficiencies. Faecal samples were also taken to determine the relationship between the nitrogen and phosphorus levels in the faeces and pasture. Due to of issues with grazing management and distinct differences in paddocks, land types and pasture values, the data was not easily interpreted and therefore failed to produce meaningful results. There was no final report published for this project.

Document Location: For information regarding this project contact the DoR office in Tennant Creek.

Keywords: supplement, disease

10. Breeder Herd Efficiency: Austral Downs

Project Officers: A. Doust and D. Savage (DoR)
Location: Austral Downs Station
Date: 2000-03

Summary: This project investigated the performance of a breeder herd under typical commercial conditions. One of the principal causes of poor reproductive performance in beef cattle was found to be an extended anoestrus period after calving in which the cows were not cycling, extending the inter-calving interval and therefore lowering productivity. Breeder herd efficiency (kg calf weaned/100 kg cow mated) was measured for three consecutive years. The herd of approximately 850 Santa Gertrudis breeders was mustered twice a year and their weight, condition score, pregnancy and lactation status were documented.

Document Location: Technical Annual Report 2001-02 (Page 68-72).

Keywords: anoestrous, inter-calving interval (ICI), Santa Gertrudis

11. An Observational Study on Calf Losses

Project Officers: A. Brown (DoR)
S. Towne and S. Jephcott (Stanbroke Pastoral Company)
Location: Brunchilly Station
Date: 2001–02

Summary: This observational study on calf losses was conducted in order to obtain more information on causes of calf mortality in extensively-grazed herds. There was concern across the northern Australian cattle industry about foetal/calf losses during the period from pregnancy diagnosis to branding, which was thought to range from 6% to 28%. During the study period, there was no evidence of infectious agents causing calf mortality. Blood samples were sent for serological testing at the Berrimah Veterinary Laboratory for bluetongue virus enzyme linked immunosorbent assay (ELISA) test, bovine viral diarrhoea (BVD) agar gel immunodiffusion test, akabane virus, aino virus serum neutralisation test, bovine ephemeral fever (BEF) serum neutralisation test, *Leptospira interrogans* serovars *hardjo*, *pomona* and *tarrasov* microscopic agglutination test and infectious bovine rhinotracheitis (IBR) virus neutralisation test. Vaginal swabs were collected for IgA antibody testing for *Campylobacter fetus* sub *venerealis* by ELISA. Aborting heifers tested negative to vibrio using the IgA ELISA method. Pregnancy testing of 350 heifers detected that 3% had aborted since the previous pregnancy test. The calf loss rate of 20.8% in the study group was similar to that in the remaining 3210 heifers on the property, which experienced a 23.4% loss. Mismothering deaths accounted for 4% of the study group in a 23 km² paddock. In a larger paddock (200 km²) typical of the Barkly, even higher losses would have been expected. Heifers were regularly seen searching for their calves after watering at a bore. The distance from the bore did not appear to contribute to calf loss. This was only an initial study that did not take into account changes in seasonal conditions, land types and management systems. The authors' recommendations as a result of this study included selection of bulls with low birth weight EBV's and over-joining heifers to allow for up to 20% mortality.

Document Location: Brown, A., Towne, S. and Jephcott, S. (2003). An Observational Study on Calf Losses on the Barkly Tableland, Technical Bulletin No. 309.
DoR Library, Tennant Creek.

Keywords: bluetongue virus, bovine viral diarrhoea (BVD), bovine ephemeral fever (BEF), infectious bovine rhinotracheitis (IBR), vibrio

12. Industry Initiatives to Improve Heifer Performance in the NT

Project Officer: T. Schatz (DoR)
Location: Benmarra Station, Avon Downs Station, Helen Springs Station, Alexandria Station, NT-wide
Date: 2004-09

Summary: This NT-wide project evaluated the current status of heifer performance throughout the Katherine/Victoria River district, Barkly and Alice regions. Pregnancy rates in maiden heifers and first-calf heifers and calf loss rates were recorded on commercial properties across the NT (including four properties in the Barkly district). Performance recording on NT cattle stations found that conception rates are usually adequate (>75%) in two-year-old maiden heifers. There was a large variation in re-conception rates in first-calf heifers (from 1% to 88%); however, re-conception rates were usually low (<25% on ¼ of properties). Calf loss rates in first calf heifers were often high (>30%) and averaged 22%.

The research found that there was a very strong relationship between heifer weight and conception rates. Conception rates are higher when heifers are heavier (in better condition) and tables were produced showing the pregnancy rates expected from different joining weights.

Another aspect of the research was the establishment of demonstration sites on commercial properties where management practices of interest to producers in the area were evaluated. This was an opportunity for producers to see management practices tested in which they were interested but for which they did not have the time, resources or research skills to evaluate for themselves. The Barkly demonstration site (at Helen Springs) had to be abandoned due to drought but the work at the demonstration sites in the Katherine (Newry) and Alice Springs (Tieyon) regions was completed.

A best practice manual for heifer management in northern Australia has been produced using the findings of this project and will be available by 2011.

Document Location: Technical Annual Report 2006-07 (*Page 80-82*).
Technical Annual Report 2007-08 (*Page 69-71*).
Annual Research Report 2008-09 (*Page 56-57*).
Schatz and Hearnden (2008). *Australian Journal of Experimental Agriculture* **48**:
940-944.
Final report – MLA website.
Heifer best practise manual – MLA.

Keywords: heifers, re-conception rates, conception

NUTRITION

13. Deficiencies in Cattle Nutrition at McArthur River Station

Project Officers: A. Schlink, G. Bastin (CSIRO)
M. Carpenter, G. Chubb and A. Brown (DoR)
Location: McArthur River Station
Date: 1985–91

Summary: This trial was undertaken to determine whether there were nutritional deficiencies in cattle grazing in the McArthur River region. The results showed that wet season supplementation is feasible, although the biological responses are small and significant only for some categories of cattle. The average wet season intake of the supplement over the three years was 216 g/head/day corresponding to 102 g crude protein, 11 g phosphorus and 0.8 g MJ energy/day, assuming no calf consumption. This level of supplementation significantly increased the live-weight of non-lactating, pregnant cows at the end of the wet season but had no significant effect on any other reproductive categories. On average, the wet season supplemented group was 23 kg heavier than the control at the end of the wet season. Cows conceiving in December/January and calving in September/October were more likely to conceive again within three months of calving than cows that conceived at other times of the year. Lactating cows lost considerable weight during the dry season, whereas dry cows at this time lost little weight.

Document Location: Technical Annual Report 1989-90 (*Page 57-58*).
Schlink, A. C., Carpenter, M. and Brown, A. (1994). Productivity of a *Bos indicus* cross cattle herd in the western gulf region on the Northern Territory, *Proceedings of the Australian Society of Animal Production*, **20**: 93-96.

Keywords: supplement, crude protein, phosphorous

14. Water Medication

Project Officer: J. Stefani (DoR)
Location: Barkly Region
Date: 1989

Summary: A preliminary investigation was conducted on the use of water medicators and availability of equipment in the NT. A demonstration site was established on Brunette Downs station with the Dosatron 8000 inline dispenser model trialled during the demonstration.

Document Location: Information relating to the equipment used and demonstration design on file at DoR Tennant Creek.

Keywords: water medicators

15. Review of Soluble Nutrient Dispensers for Livestock

Project Officers: M. Adams and D. Savage (DoR)

Location: Hayfield Station, Barkly Region

Date: 1996-98

Summary: During this review of water medication, 16 properties were visited and numerous contacts were made with others with experience or knowledge of various aspects of water medication. In most instances, producers found that maintenance and operating requirements of the system were greater than originally anticipated. All producers said they observed positive effects of the supplement on their stock. The capital cost of establishing a water supplement system is considerable and the operating cost, including labour and maintenance, may also be greater than alternative methods. The use of water medication systems has been restricted by negative perceptions about the reliability, safety, capital cost and need for skilled maintenance of water medication units.

Document Location: Technical Annual Report 1996-97 (*Page 122-124*).

Technical Annual Report 1997-98 (*Page 117-118*).

Keywords: water medication, supplement

16. Nutritional Value of Native Pasture

Project Officer: C. Materne (DoR)

Location: Alexandria Station

Date: 1997-2000

Summary: This project was undertaken to gain information on the levels of nitrogen, phosphorus and metabolisable energy supplied to grazing animals by native pasture at the beginning and end of the dry season as an aid to decision making for supplementation programs. Data from this research have since been used in the booklet "Mitchell Grasslands Quality and Quantity Guide" by C. Materne.

Document Location: Technical Annual Report 1998-99 (*Page 162*).

Keywords: nitrogen, phosphorous, native pasture

17. Nutritional Influences on Barkly Beef Breeding Performance

Project Officer: D. Savage (DoR)
Location: Alexandria Station
Date: 1997-2002

Summary: This project aimed to demonstrate the influence of nutrition on the reproductive performance of herds in the Barkly Region. A total of 5279 breeder and 2006 calf records were collected from four composite herds (6/16 Brahman, 5/16 Shorthorn, 2/16 Africander, 2/16 Charolais, 1/16 Hereford). The reproductive performance achieved by the breeders in this study exceeded industry benchmarks for northern Australia. Improvements in weight and body condition score (BCS) were attributed to higher nutrient intakes as a consequence of good seasons and nutrient supplementation. In contrast to previous research, maiden heifers achieved a higher second calf pregnancy rate than the first calf rate, and were equal to the cow pregnancy rate. The results of the study indicate that calf growth and weaning weights are reduced as breeder BCS increases. An important caveat to this conclusion is that the relationship only applies for breeders at BCS 4 or above. This study used cattle of a new breed combination consisting of 37.5% *Bos taurus* and 62.5% *Bos indicus*, as opposed to the more common breeds in northern Australia with a high (>70%) *Bos indicus* content. This study demonstrated that when suitable nutrition is provided, yearling-mating of heifers combined with a four-month joining period can be practised and in these conditions cattle with as low as 37.5% *Bos indicus* content can achieve 90% pregnancy rates. The project increased awareness of the importance of timing of rainfall (as opposed to amount of rainfall) on pasture quality and therefore supplementation requirements.

Document Location: Savage, D. (2004). Nutritional Influences on Reproductive Performance of Beef Cattle in the Barkly Tableland. (PhD Thesis, University of New England).
Savage, D. (2005). Nutritional Influences on Beef Breeding Performance, MLA Final report.
Savage, D., Gaughan, J., Murray, P., Lisle, A. and Peatling, S. (2004). Effect of breeder body condition and weight on pregnancy and calf growth in three age-groups of composite-bred beef cattle, *Animal Production in Australia*, **25**: 156-159.
Savage, D. (2005). 'Nutritional management of heifers in northern Australia into the future. *In*: Recent Advances in Animal Nutrition in Australia, Armidale, NSW. DoR Library, Tennant Creek.

Keywords: nutrition, reproductive performance, body condition score (BCS), *Bos indicus*, *Bos taurus*

18. Collection of Faecal Diet Pairs for the Calibration of Faecal Near Infrared Reflectance Spectroscopy

Project Officers: J. Akeroyd and C. Materne (DoR)

Location: Brunchilly Station

Date: 1999-2003

Summary: The purpose of this project was to assist with the calibration of the faecal near infrared reflectance spectroscopy (NIRS) method for predicting diet quality in grazing cattle. Six pen feeding trials were successfully undertaken to generate data for the CSIRO Davies Laboratory, Townsville. Corresponding diet and faecal samples from pen-fed animals were collected and the data was used to develop relationships that predicted cattle performance based on NIRS analysis of faeces. Results from the analysis indicate that the harvested pasture fed to the cattle in the pens was different to the diet that had been selected by the steers while grazing in the paddock. Relationships between diet quality measured by conventional means and by faecal NIRS predictions could not be established.

Document Location: Technical Annual Report 2001-2002 (*Page 78*).

Coates, D. (2004). Faecal NIRS- Technology for Improving Nutritional Management of Grazing Cattle, CSIRO Sustainable Ecosystems.
DoR Library, Tennant Creek.

Keywords: faecal near infrared reflectance spectroscopy (NIRS), diet quality

HUSBANDRY

19. The Use of Ivomec® in the McArthur River District

Project Officer: J. Stefani (DoR)
Location: McArthur River Station
Date: 1991-92

Summary: A trial was conducted in the Gulf District of the NT to measure the response in weight gain of export steers treated with Ivomec®. One hundred Brahman x Shorthorn and Shorthorn steers were randomly selected. Forty-nine of the steers received two treatments of Ivomec®, and the remaining 51 steers formed the control. There was no significant difference in the mean weight in the treatment group and the control group. Similarly, there was no significant difference in the mean weight of steers of different breeds. The visual response of a shiny coat was observed in some steers treated with Ivomec®. Conclusions were made that it was uneconomic to use Ivomec® on export steers in the Gulf district of the NT, unless a premium price was received as a result of the improved visual appearance of the animals.

Document Location: Technote No. 85. (1994). The Use of Ivomec® in the Gulf District of the NT.
<http://www.nt.gov.au/d/Content/File/p/Technote/TN085.pdf>

Keywords: Ivomec®, Brahman, Shorthorn, export

20. Post Weaning Performance of Weaner Heifers in the Tennant Creek Region

Project Officer: J. Stefani (DoR)
Location: Tennant Creek Region
Date: 1992

Summary: A preliminary investigation was conducted to gather and collate data on post- weaning performance of weaner heifers up to their first mating on several properties in the Tennant Creek Region. Groups of 100 heifers were randomly selected on each property at weaning. Weaning weights were recorded and average daily weight gain was calculated. The project was hampered by unseasonal conditions. The data collected indicated an average daily gain of 0.12 kg per day and an average weaning weight of 190 kg.

Document Location: For information regarding this project contact the DoR office in Tennant Creek.

Keywords: heifers, weaning weight

21. Cow/Calf Separators

Project Officers: M. Adams and D. Savage (DoR)

Location: Barkly Region

Date: 1995-98

Summary: The objective of this study was to design and construct separator panels capable of removing weaners and late season calves with minimal disturbance to the breeder herd. This would also reduce mustering and labour costs associated with conventional musters. Two prototypes were tested in the region. A prototype based on the 'Alroy' design was trialled on three stations. As a result, some stations incorporated the concept into usual husbandry operations. A professional plan and draft are available.

Document Location: Technical Annual Report 1997-98 (*Page 116-117*).

Keywords: husbandry procedures

22. NT Live-weight Gain Project

Project Officer: S. Streeter (DoR)

Location: Barkly Region

Date: 2007-11

Summary: The MLA funded NT Live-weight Gain project due for completion mid 2011 aims to identify and quantify the drivers of live-weight variation, within and between, ten study mobs in the NT. The study will look at a range of factors, including foraging behaviour, parasites and some disease prevalence. The project outcomes aim to include the development of a practical analytical toolkit that will assist in identifying the drivers of live-weight gain in individual herds and reduce the number of poor performing animals, thereby increasing average herd performance.

Document Location: Technical Annual Report 2007-08 (*Page 80-81*).

Keywords: live-weight gain, foraging behaviour, disease, parasites

RANGELAND

23. Mitchell Grass - Pasture Dynamics

Project Officer: G. Ford (DoR)
Location: Helen Springs Station (Jingerah bore and Middle Well)
Date: 1974-79 and 1989-91

Summary: The aim of this project was to better understand grassland dynamics by following up the 1974-79 study with more observations from 1989-91 on the effects of season and grazing on Mitchell grassland. A comparison of moderate and high utilisation rates indicated that moderate grazing maintained or slightly improved the grazing value of the grassland. A decline in basal area (and biomass) of perennial grasses during drought was more accentuated at 50-80% utilisation than at 10-30% utilisation. With the return of favourable summer rainfall, the basal area of perennial grasses returned to a higher level at 10-30% utilisation than at 50-80% utilisation. The dynamics of the grassland at this site and those reported elsewhere indicated that rainfall was the most important factor in determining biomass and composition in Mitchell grass pastures.

Document Location: Technote No 81. (1992). Mitchell Grass Pasture Dynamics on the Barkly Tableland, NT.
<http://www.nt.gov.au/d/Content/File/p/Technote/TN081.pdf>
DoR Library, Tennant Creek.
Technical Annual Report 1990-91 (*Page 46*).
Technical Annual Report 1991-92 (*Page 36-37*).

Keywords: Mitchell grasslands, utilisation

24. McArthur River Pasture Monitoring

Project Officer: G. Bastin (CSIRO)
Location: McArthur River Station
Date: 1985-87

Summary: The McArthur River Pasture Monitoring project aimed to identify the impact of grazing cattle with and without using supplementation on rangelands at McArthur River Station. Soils, pastures and the presence of woody plants were ground monitored at various sights within the trial paddocks to separate the effects of fire and seasonal conditions from the effects of grazing. Data was collected with a major monitoring session after pasture maturation each year, usually six to eight weeks after the end of the wet season, no earlier than May and no later than July. Botanical data collected included pasture yield, species composition, defoliation score, canopy cover, bare soil frequency, cattle activity and photographs. Data collected from this trial was stored in the Range Condition Assessment database and Landsat images stored at CSIRO Alice Springs.

Document Location: Appendix 10, Collaborated Research Project CSIRO/DPP/Colinta on Pasture Management and Animal Production.
DoR Library, Tennant Creek

Keywords: supplementation, rangelands

25. Barkly Rangeland Condition Assessment

Project Officer: G. Ford (DoR)
Location: Barkly Region
Date: 1989-91

Summary: The objectives of this project were to record, interpret and provide timely feedback on changes in grazed rangelands which were attributable to seasonal and management factors. The findings demonstrated that most assessment sites had a marked increase in productivity due to excellent seasonal conditions during the study period. The most dramatic effect was evident on annual grassland sites. Most of these were virtually bare in September 1989. In August 1991, however, the yields of these sites were all greater than 100 kg/ha. Most were still in good condition with a heavy stand of palatable annual grasses, such as Flinders grass (*Iseilema* spp.) and native couch or spider grass (*Brachyachne convergens*). In most instances, the Mitchell grass (*Astrebla* spp.) sites showed a marked increase in yield and slight shifts in species composition, with the actual proportion of Mitchell increasing. Several sites supported a low to moderate population of a native prickly acacia bush (*Acacia victoriae*). The presence of this species of prickly acacia has increasingly been observed across the Barkly. The cause of this is unknown, although it is suspected that the exclusion of fire from Mitchell grass country could be a contributing factor.

Document Location: Technical Annual Report 1990-91 (Page 49).
Technical Annual Report 1991-92 (Page 39-40).
Ford, G. (1991). Range Condition Assessment Survey Helen Springs Station 1989 and 1991, Department of Primary Industry and Fisheries.
DoR Library, Tennant Creek.

Keywords: Flinders grass, Mitchell grass, native couch, prickly acacia

26. Mapping of Longreach Waterhole

Project Officer: B. Pitts (CCNT)
Location: Longreach Waterhole Reserve (Newcastle Waters Station)
Date: 1990

Summary: A detailed survey was conducted of Longreach waterhole accompanying a fine scale land unit map.

Document Location: Parks and Wildlife Commission NT report and GIS data.
Pitts, B. (1990). Longreach Waterhole Vegetation Survey and Mapping. Internal Report, CCNT: Alice Springs, NT.
AZRI Library, Alice Springs.

Keywords: mapping, Longreach

27. Barkly Green Cover Reporting

Project Officer: R. Dance (DoR)
Location: Barkly Region
Date: 1990-91

Summary: The objective of this project was to continue to develop and provide a “green cover” reporting service for a familiarisation period of 12 months. Green cover is a vegetation map developed from the National Oceanic and Atmospheric Administration satellite images. Satisfactory images were obtained during this period which corresponded well with plant responses to seasonal conditions. Images were made available for public use through the Departmental internet web.

Document Location: Technical Annual Report 1990-91 (*Page 49-50*).

Keywords: green cover, vegetation map

28. Pasture Rejuvenation at Murray Downs

Project Officers: M. Goodacre and M. Adams (DoR)
Location: Murray Downs Station
Date: 1990-94

Summary: This project was initiated to gain an understanding of pasture establishment under a number of reclamation techniques and the importance of the subsequent spelling of these areas. The aim was to re-establish pasture on degraded floodplain/floodout country. Pasture rejuvenation methods, including the erection of ponding banks and various combinations of ripping, pitting and seeding, have shown variable results. Spelling during the establishment phase had the largest influence on pasture establishment and persistence. Ponding, ripping and seeding provided a superior seedbed, resulting in a more rapid and successful establishment of the sown buffel grass, compared with that of the ponded, pitted and seeded treatments. The greater soil disturbance caused by ripping increased water infiltration rates over a larger area, compared with pitting. It also prepared a rough seedbed for the buffel seed. Overall, ponding and ripping or pitting, plus seeding with a vigorous perennial pasture species have proven successful in the revegetation of scalded floodouts and floodplains on Murray Downs. Recommendations that have come out of the study include spelling country during establishment, combined with low stocking rates upon the introduction of grazing animals.

Document Location: DoR office, Tennant Creek.

Keywords: spelling, ponding banks, ripping, seeding, buffel grass

29. Remnants of Mitchell Grass Pasture Undisturbed by Cattle

Project Officers: D. Berman, B. Pitts and C. Walker (CCNT)

Location: Barkly Region

Date: 1992

Summary: This study was undertaken as a consultancy report by the Wildlife Division of the Conservation Commission of the NT for the Australian Nature Conservation Agency with the aim of determining the position and extent of Mitchell grassland currently undisturbed by cattle in the Barkly. It was found that only a very small proportion (1.8%) of remnant Barkly Mitchell grassland remains further than 8 km from water, which was taken as the limit of normal grazing activity. The pasture biomass, cover and species composition in these remnants differed very little from pasture that was excluded from grazing. The Conservation Commission's Geographic Information System proved a very useful tool for locating remnants of Mitchell grassland undisturbed by cattle. Recommendations that came out of the study included the need to integrate pastoral and wildlife management to ensure wildlife conservation and sustainable cattle production on the Barkly.

Document Location: Berman, D., Pitts, B. and Walker, C. (1992). Remnants of Mitchell Grass Pasture Undisturbed by Cattle on the Barkly Tableland, CCNT.
DoR Library, Tennant Creek

Keywords: Mitchell grasslands, pasture biomass

30. Seasonal Productivity of Native Pastures

Project Officer: F. Anderson (DoR)

Location: Helen Springs Station

Date: 1994-97

Summary: This project aimed to increase the understanding of how seasonal variation affects pasture yield and composition under grazing. Pasture composition and yield were assessed against available climatic data at 12 grazed sites and one enclosure established in 1973 at Jingerah bore. Results indicated that there was little variation between yields inside and outside the enclosure each year. Pasture composition varied, with ungrazed enclosure sites having a higher percentage of palatable perennial grasses and a lower percentage of palatable annual grasses. The basal diameter of each of the three most desirable perennial grasses did not vary significantly inside or outside the enclosures. The project was concluded earlier than planned because of difficulties in comparing grazed and ungrazed sites.

Estimated pasture yield (kg/ha)

km from bore	Inside enclosure				Outside enclosure			
	0.8	1.6	3.2	3.6	0.8	1.6	3.2	3.6
April 1994	1899	2106	1768	-	1956	2204	1908	-
July 1995	830	890	505	446	745	817	307	306
September 1996	1713	1240	293	425	1747	1237	210	296

Document Location: Technical Annual Report 1995-96 (*Page 70*).
 Technical Annual Report 1996-97 (*Page 128-129*).

Keywords: pasture yield, pasture composition, enclosure, perennial grasses

31. Establishment of Regional Tree and Shrub Monitoring on the Barkly

Project Officers: D. Brock, A. White and R. Dance (DoR)

Location: Barkly Region

Date: 1994-98

Summary: The primary objective of this study was to establish baseline tree and shrub cover data in order to assess future changes and to also establish a network of sites designed to investigate the woody vegetation change. Fixed recording sites were established to monitor woody weeds and diminishing tree and shrub populations. The information collected from these sites was collected to develop a regional strategy.

Document Location: Technical Annual Report 1995-96 (*Page 84-85*).
 Technical Annual Report 1997-98 (*Page 183*).

Keywords: woody vegetation, woody weeds

32. The Control of Woody Perennials – Blade Ploughing

Project Officer: F. Anderson (DoR)
Project Location: Phillip Creek Station
Date: 1994-99

Summary: The objective of this project was to assess blade ploughing as a means of controlling dense stands of woody perennial shrubs, particularly turpentine (*Acacia lysiphloia*) on the red soils of the Barkly. The two holding paddocks used in this trial contained dense stands of woody perennials that interfered with mustering and inhibited pasture growth, providing insufficient dry matter to support cattle or fire. The two paddocks were blade ploughed and sown with USA buffel grass (*Cenchrus ciliaris*) and Seca stylo (*Stylosanthes scabra*) in 1994. In one of the holding paddocks the number of woody seedlings increased from 4216 seedlings/ha to 20 319 seedlings/ha in 1996. However, the second paddock had an insignificant change in the number of seedlings per hectare and was attributed to the presence of an established stand of buffel grass prior to blade ploughing and a marginally different soil type. After blade ploughing, the buffel grass in the second holding paddock quickly re-established and provided competition for the woody seedlings. Further study was required and more extensive work of a similar nature was included in the “Waterponging on Red Country” project.

Document Location: Technical Annual Report 1995-96 (Page 126-127).

Keywords: Blade ploughing, turpentine, red soils, Buffel grass, Seca stylo

33. Improving Mitchell Grass Production by Spelling and Reseeding

Project Officers: F. Anderson and D. van Rangelrooy (DoR)
Location: Barkly Region
Date: 1996-97

Summary: This trial aimed to determine whether reseeding Mitchell grass (*Astrelba* spp.) would prove to be a viable method of improving the condition of native pasture after mechanical control of weeds. Two methods were compared. The first was to remove grazing animals from the sight, while the second method involved disturbing the soil using a cutterbar in combination with excluding grazing. Both of these methods were followed by sowing with barley Mitchell grass (*Astrelba pectinata*). The results of the trial showed that disturbed, ungrazed, sown treatment established most successfully; however, the report stated that spelling, or spelling in conjunction with mechanical control and reseeding, were both successful in the regeneration of native pasture species.

Document Location: DoR Library, Tennant Creek

Keywords: Mitchell grass, weeds, spelling

34. Water Ponding on Red Country

Project Officers: F. Anderson and C. Materne (DoR)
Location: Murray Downs Station
Date: 1996-99

Summary: The objectives of this trial were to investigate the suitability of various native and introduced pasture species for pasture establishment behind ponding banks and to promote spelling as an effective management tool. One control and seven trial plots containing one of four grass species, or three legume species, were sown in strips behind eight ponding banks with an electric fence erected to exclude stock. Allocation was random. The results indicated that all introduced and native grass and legume species established successfully; however, sabi grass (*Urochloa mosambicensis*), native millet (*Panicum decompositum*) and verano stylo (*Stylosanthes hamata*) were most successful. Legume species were able to establish in the banks that held more water, whereas the drier banks were favoured by the grasses.

Document Location: Technical Annual Report 1995-96 (Page 71).
Technical Annual Report 1998-99 (Page 162-163).

Keywords: Ponding banks, legume, native grass, sabi grass, native millet, verano stylo

35. Barkly Rangeland Assessment

Project Officer: F. McGregor (DNRETAS)
Location: Barkly Region
Date: 1996-2000

Summary: The project aimed to establish a monitoring process to regulate industry utilisation of pasture resources. A small section of this vast area, stratified into land types, was reported on with results showing the ability of derived satellite imagery to document seasonal pasture recovery. From this project, a database was set up across the Barkly, allowing any given paddock or bore to be comparatively assessed both spatially and temporally according to land type.

Document Location: McGregor, F. (2000). Barkly Rangeland Assessment Final Report to NHT, Department of Lands, Planning and Environment. DoR Library, Tennant Creek.

Keywords: utilisation, satellite imagery

36. Irrigated Fodder Production Evaluation on Helen Springs

Project Officers: J. O’Kane (Stanbroke Pastoral Company)
J. Thompson (Netafim Australia)
D. Parker, J. Purdie, T. Price, C. Materne and M. Goodacre (DoR)

Location: Helen Springs Station

Date: 1999-2001

Summary: The aim of this demonstration was to conduct a preliminary evaluation of fodder species and fertiliser requirements for growing forage crops on black cracking clay soils. Many problems were encountered during the trial, including mechanical and irrigation inefficiencies and pests, resulting in the need for modification of trial design. Species evaluated included two sorghum varieties (Jumbo and Sugargraze) and one legume (Milgara blue pea). It was estimated that yields of 40 to 50 t/ha dry matter production could be achieved under irrigation from Jumbo and Sugargraze, while Milgara blue pea was estimated to produce 20-25 t/ha under similar conditions. The legumes produced higher crude protein levels than the forage crops. It was recommended that under commercial conditions the highest yields could be achieved through crop rotation and annual replanting in August, to ensure plants were established before the hottest periods of the year. The demonstration did not adequately address the question of fertiliser requirements. The report recommends validating the findings by expanding to a commercial sized operation.

Document Location: Irrigated Fodder Production Evaluation on Helen Springs Station 1999-2001.
Final Report.
Irrigated Fodder Production in the Barkly Region of the Northern Territory 1999.
Draft Progress Report.
DoR Library, Tennant Creek.
Technical Annual Report 1999-2000 (*Page 55-56*).

Keywords: fodder species, fertiliser, sorghum, legume

37. Biogeography and Conservation of Mitchell Grasslands

Project Officer: A. Fisher (DNRETAS)

Location: Barkly Region

Date: 2001

Summary: This PhD study investigated the conservation values, reservation status and optimal reserve design to adequately conserve the biodiversity values of Mitchell grasslands on the Barkly. There are many prominent species that occur throughout the Mitchell grasslands, such as 61 plant species and 17 vertebrate species, including several endemic reptile species. Only 0.5% of the Mitchell grasslands are currently within the formal reserve system, and most of the VRD (99%) and Barkly (97%) Mitchell grasslands are within 10 km from waters and are therefore subject to grazing. Surveys of species abundance out from waters in the Barkly and VRD found that, while many species were advantaged or not affected by distance to water, 21 ant species, 16 bird and reptile species and 25 plant species declined in abundance closer to waters due to the higher levels of grazing pressure. Surveys of cattle activity out from waters found that on average, cattle spent 60% of their time within 3 km from water, and a further 20% of their time between 3-5 km from water. Because species tended to be confined to small geographic areas, rather than dispersed evenly across the Mitchell grasslands, the study suggested that the optimum design of a reserve system to adequately maintain these

grazing-sensitive species would be to have numerous smaller reserves, or areas on stations protected from grazing, rather than a few large reserves.

Document Location: PhD Thesis, Northern Territory University, Darwin.
DoR Library, Tennant Creek.

Keywords: biodiversity, Mitchell grasslands

38. Rangeland Assessment of the Barkly Pastoral District 2004

Project Officers: R. Karfs and N. Saunders (NRETA Land Monitoring Branch)

Location: Barkly Region

Date: 2004

Summary: Land condition on 17 Barkly properties was studied using satellite imagery and limited field inspection. This involved satellite data from 2000, 2002 and 2003, and ground truthing in August 2004, using the Grazing Gradient Technique developed by CSIRO. It was concluded that this was a valid technique so long as recent seasonal conditions and management histories in the district were known. The field inspections in August 2004 followed an exceptionally good wet season across the district. The study concluded that the majority of the Barkly was in good condition or improving condition. There were, however, a number of areas showing persistent grazing effects and therefore decreased condition.

Document Location: Report to the NT Pastoral Land Board, 46pp.
Electronic copy on file DoR, Tennant Creek.

Keywords: land condition, satellite imagery

GRAZING MANAGEMENT

39. Grazing, Walking and Watering Behaviour of Cattle on Alroy Downs

Project Officer: P. J. Schmidt (University of New England)

Location: Alroy Downs

Date: 1969

Summary: The grazing behaviour of shorthorn cattle was observed in the hot late dry season on three types of unfenced country on Alroy Downs: open Mitchell grass downs with no shade, desert country with ample shade, and an intermediate type with restricted shade. Particular attention was paid to the distances walked by cattle in relation to water points. It was observed that cattle had rigid movement patterns, which were related to environmental conditions. In the open downs country without shade, the cattle congregated around the water in the heat of the day from about 9 a.m. to 4 p.m. However, in the areas where there was ample shade, cattle would often spend the day away from water and come in to drink in the evening or at night.

In the open downs country, it was observed that cattle could be differentiated into two distinct behavioural types. Some were “walkers” and briskly walked out to graze up to 8 km from water. Others (the “non-walkers”) moved out slowly and never ranged farther than 4-5 km out. It was suggested that the “non-walkers” were less well adapted and would lose condition and have a higher mortality in harsh seasons. The study concluded that there was scope for selecting animals that were adapted to walking long distances and this may be more cost-effective than installing additional bores.

Document Location: Behaviour of cattle in a hot dry region of the NT with particular reference to walking, watering and grazing. M. Rural Science Thesis, UNE.

DoR office Tennant Creek.

The conclusions of this research are also described in chapter 10 of Beef Cattle Production by N. T. M. Yeates and P. J. Schmidt (1974) published by Butterworth Sydney.

Keywords: Shorthorn, Mitchell grass

40. Carrying Capacity of Different Land Types

Project Officers: R. Allan, H. James, G. Nash and K. Scott (DoR)

Location: Land systems of the Barkly Region; Creswell, Pollyarra, Wonorah, Barkly and Austral

Date: 2004-09

Summary: The aim of this project was to develop and test methods of objectively estimating long and short-term carrying capacities in the major pastoral land systems of the NT. Pasture growth, soil moisture, species composition, plant nutrient and ground cover data were collected following SWIFTSYND methodology at 11 sites across the Barkly over a period of five years. This data was used to develop pasture growth models for these land systems using the pasture growth model GRASP. GRASP can now be used to calculate year by year, long-term average and percentile pasture growth on these land systems. This pasture growth information is combined with recommended utilisation rates to estimate safe stocking rates for different land types and years. It will be used for the Barkly course, and for assisting producers to assess carrying capacity and development opportunities in the Barkly region.

Document Location: Technical Annual Report 2002-03 (*Page 98-99*).

A final NT-wide report of all pasture growth sites in the Sturt Plateau, Barkly and Alice Springs regions is due in 2011.

Keywords: carrying capacity, pasture growth, soil moisture, species composition, land type

41. Newcastle Waters Rotational Grazing

Project Officers: P. Clark, A. Bubb and R. Cowley (DoR)

Location: Newcastle Waters Station

Date: 2000-05

Summary: This cell grazing project was initiated in 2000 in old holding paddocks on the Barkly stock route. Baseline vegetation data was collected from paddocks within the cells at commencement of the program. Cattle were placed in the cell grazing situation, including a control to allow production comparisons. Vegetation monitoring was scheduled twice annually for pasture composition, yield, ground cover, grazing and canopy cover. Cattle were weighed twice annually.

Document Location: Technical Annual Report 2003-04 (*Page 94*).

Technical Annual Report 2006-07 (*Page 108-111*).

The findings of this project are due to be released at the end of 2010. For information regarding this project, contact the DoR office in Tennant Creek.

Keywords: cell grazing, vegetation monitoring, pasture composition, pasture yield

42. Rockhampton Downs Alternate Watering Points Trial

Project Officers: E. Hannah, S. Kearins and B. Wratten (AACo)
A. Bubb and H. James (DoR)

Location: Rockhampton Downs Station

Date: 2004-06

Summary: This study reports on an innovative rotational grazing trial conducted on Rockhampton Downs Station in the Barkly Tableland region of the NT. Rather than develop new fences to create multiple paddocks, cattle were rotated around a paddock by controlling the availability of water at each of several new and existing water points, by having only one water point at any time.

The objective was to determine the feasibility of such a rotational grazing regime and the impacts on pasture and cattle production.

The trial demonstrated that such a rotational grazing system could be implemented on commercial beef cattle properties. This represents a substantial mind-shift away from a continuous set-stocked regime traditionally employed throughout northern Australia. The principal findings of the study are presented below.

1. Infrastructure development, labour costs and management of cattle present initial challenges. Cattle behaviour was difficult to manage, particularly in the first two years. Over time though, managers devised a procedure whereby the next water point was turned on, and the current water point was turned off, on the day prior to moving the cattle. This significantly reduced the labour required to implement the system. Managers used the rotational grazing system to have cattle closer to the yards at mustering times, thereby saving a significant amount of time and money. These cost savings, achieved through more efficient management, will help to offset the initial capital investment.
2. Infrastructure development (installation of new water points) increased carrying capacity by increasing the watered area of the paddock. Higher stocking rates could be achieved in areas traditionally ungrazed (by virtue of their higher yield), but this bonus will be reduced over time if not managed in a sustainable manner.
3. Land condition (measured by species composition, yield and cover) associated with new water points in the rotational grazing paddock appeared to follow a trajectory of degradation towards that shown around old water points with a long history of continuous stocking.
4. There was no significant reduction in total species richness during the three-year trial and the abundance of the dominant perennial Mitchell grasses was stable except for immediately adjacent to water points.
5. The rotational grazing strategy did not improve the existing poor land condition surrounding old water points during the period of the study.
6. At its completion, the trial gave station managers a better understanding of the possibilities of manipulating pasture utilisation and they expressed interest in applying that knowledge to future grazing management strategies.

Document Location: K. Scott, H. James, S. Kearins and R. Cowley. (2010). 'Water instead of wire': Managing grazing by alternating water points on the Barkly Tableland. Final Report to MLA (project S2004/NT01).
Technical Annual Report 2005-06 (*Page 9-10*).
Technical Annual Report 2006-07 (*Page 135-136*).

Keywords: rotational grazing, land condition, infrastructure development

43. Northern Grazing Systems Study

Project Officers: D. Walsh, R. Cowley, S. Leigo and C. Collier (DoR)
Location: Barkly Region, Alice Springs Region, Victoria River district
Date: 2009-ongoing

Summary: The aim of the Northern Grazing Systems project due for completion at the end of 2012 is to develop practical, region-specific best-bet guidelines for grazing management in the extensive beef sector of northern Australia by using the key practices of pasture spelling, managing stocking rates, prescribed burning and infrastructure development. The main outcomes of the project include improving animal production and economic performance, maintaining and improving land condition and improving risk management in relation to climate variability. Two Northern Grazing Systems workshops have been held in the Barkly region (April 2009 and April 2010) where a range of participants from DoR, BRAC and key producers worked to:

- Document current and best-bet management practices in the region.
- Describe potential improved management practices.
- List scientific studies that have occurred in the region.
- Describe two representative grazing properties for bio-economic modelling.
- Discuss the results of bio-economic modelling and identify priorities for research and extension.

Document Location: DoR office Tennant Creek.

Keywords: grazing management, pasture spelling, stocking rates, prescribed burning, infrastructure development, land condition, climate variability

44. Helen Springs Producer Demonstration Sites (PDS)

Project Officer: C. Duggan (DoR)
Location: Helen Springs Station
Date: 2010-ongoing

Summary: This ongoing project aims to document and demonstrate the use of a breeder segregation system to assist with cow herd management, implementing a paddock management system based on Grazing Land Management principles to improve and/or maintain good land condition, and incorporating paddock measures into the current recording system to allow for easy access to information to make management decisions. Preliminary PDS outcomes will feature in the Barkly Grazing Land Management Workshop due to be held in November 2010.

Document Location: DoR office, Tennant Creek.

Keywords: breeder segregation, grazing land management, land condition

LAND, SOIL AND WATER RESOURCES

45. Survey of Barkly Land Systems 1947-1948, 2010-2011

Project Officers: C. Christian, L. Noakes, R. Perry, R. Slatyer, G. Stewart and D Traves (CSIRO)
Brian Lynch (DNRETA)

Locations: NT and Queensland

Date: 1947-48

Summary: A field study of the Barkly region was initiated at the request of the Northern Australian Development Committee to provide accurate knowledge of the nature of the area and its potential uses. The information from this report was to be made available for the formulation of policies concerning development. The surveys described, classified, and mapped the region. Surface geology, topography, soils and vegetation were studied in order for the country to be subdivided in a fundamental rather than superficial way, so that the lands of large regions could be classified and mapped at a relatively rapid rate. This document has recently been reviewed and is currently in the process of being updated and is due for completion in early 2011.

Document Location: Christian, C., Noakes, L., Perry, R., Slatyer, R., Stewart, G. and Traves, D. (1951). Survey of the Barkly Region, Northern Territory and Queensland, 1947-48, CSIRO Publication
DoR Library, Tennant Creek

Keywords: land system

46. Land Resources of Helen Springs Station

Project Officer: A. Grant (DNRETA)

Location: Helen Springs Station

Date: 1987-89

Summary: This report documents the land resources of Helen Springs Station. This work aimed to assist with land management and decision-making on the property. Thirty-six land units were identified and described. The land management implications, specifically for pastoral use and soil management, are described for each land type.

Document Location: Grant, A. (2003). The Land Resources of Helen Springs Station, Natural Systems Division, Department of Infrastructure, Planning and Environment, Report Number 20/2003A.
DoR Library, Tennant Creek.

Keywords: land resources, soil management, land type

47. Landscape Evolution on the Barkly

Project Officers: C. Edgoose and K. Winstanley (DLPE)

Location: Barkly Region

Date: 1994

Summary: This report outlines the geology of the Barkly region and its formation. A geological, geomorphologic and climatic historical analysis of the last 500 million years was completed. The findings indicated that while some areas have changed little on a large scale, the changes over immense periods of time can be dynamic.

Document Location: A preliminary report from this study was published in the proceedings of the 1994 Katherine Rangelands Conference: 'Clean Country, Clean Product, Clean Profit'.
DoR library, Tennant Creek

Keyword: geology

48. Land Resources Mapping of Barkly Pastoral Properties

Project Officers: C. Edgoose, A. Kennedy and K. Lehman (DLPE)

Location: Alroy Station, Brunette Downs Station, Mittiebah Station and Walhallow Station

Date: 1996

Summary: These reports documented the land resources of a selection of stations. This work aimed to assist with land management and decision-making on the properties. Between 24 and 51 types of country (land units) were identified and mapped, each described in terms of landform features, soil type and vegetation. The land management issues, specifically for pastoral use and soil management, were described for each land type.

Document Location: Edgoose, C. and Kennedy, A. (1996). The Land Resources of Walhallow Station, Natural Resources Division, Department of Lands Planning and Environment, Technical Memorandum 96/4.
Edgoose, C. and Kennedy, A. (1996). The Land Resources of Brunette Downs Station, Natural Resources Division, Department of Lands Planning and Environment, Technical Memorandum 96/01.
Edgoose, C. (1996). The Land Resources of Mittiebah Station, Natural Resources Division, Department of Lands Planning and Environment, Technical Memorandum 96/3.
Edgoose, C. and Lehman, K. (1996). The Land Resources of Alroy Downs Station, Natural Resources Division, Department of Lands Planning and Environment, Technical Memorandum 96/1.
DoR Library, Tennant Creek.

Keywords: land resources, land type

49. Land Resources of Argadargada Station

Project Officers: S. Reu and V. Garbin (NRETAS)

Location: Argadargada Station

Date: 1998

Summary: This report documents the land resources of Argadargada Station. This work aimed to assist with land management and decision-making on the property. Thirty-five land units were identified and described. Land unit descriptions include a general outline of the main landscape features, a summary of management issues and a representative photograph.

Document Location: Rue, S. and Garbin, V. (1998). The Land Resources of Argadargada Station, Land Resources Division, Department of Lands Planning and Environment, Technical Memorandum 98/1. DoR Library, Tennant Creek.

Keywords: land resources, land unit

50. Vascular Plant Checklist for the Mitchell Grass Downs

Project Officer: A. Duguid (DoR)

Location: Barkly Region and other parts of the NT

Date: 1999

Summary: This document is in the form a list of vascular plants found in the NT Mitchell grass downs based on Herbarium records as at May 1997.

Document Location: Duguid, A. (1999). Vascular plant checklist for the Mitchell grass downs biogeographic region of the NT. DoR Library, Tennant Creek.

Keywords: vascular plants, Mitchell grass

51. Water Resource Mapping

Project Officer: S. Tickell (DLPE)

Location: Barkly Region

Date: 2003

Summary: Three maps were prepared, summarising water resources across the Barkly and detailing options available for water supply development. For a particular area, these indicated the most suitable type of water supply and their potential uses.

Document Location: DoR Library, Tennant Creek.

Keywords: water resources

TECHNOLOGY

52. Satellite Remote Sensing on Helen Springs Station

Project Officer: G. Hodgson (DoR)
Location: Helen Springs Station
Date: 1991-94

Summary: This project aimed to commence evaluation and, where appropriate, adopt information sources based on satellite remote sensing. This land resource mapping exercise was conducted at the end of the 1990-91 wet season on Helen Springs pastoral lease. The image was captured with seven channel Landsat TM imagery using a microBRIAN image analysis system. The selected image was captured at the height of the vegetation flush, with the aim of identifying different land resources. Two classification maps were produced: a land unit map and a land type map. The 16-class land unit classification map was complex, confusing and lacked continuity. The cross plot showed little spectral separability amongst the classes and the classification accuracy was poor. The 4-class land type classification mapped more simply, and the classification accuracy was moderately useful. Although the results of the analysis were acceptable, the poor spectral separability amongst the classes meant that the results of this exercise generally could not be transferred to classifications of imagery of other scenes and dates.

Document Location: Technical Annual Report 1991-92 (*Page 37-38*).

Keywords: satellite remote sensing, land resources, land unit, land type

53. Telemetry: Remote Monitoring of Water Points

Project Officers: M. Adams and J. Peart (DoR)
Location: Tennant Creek Station
Date: 1992-97

Summary: This project aimed to investigate the use of telemetry and its potential to assist in the monitoring of watering points. This project demonstrated that bores at significant distances from the homestead could be reliably and accurately monitored using HF radio signals. The system used was complex in relation to the number of functions being utilised. The base model Elpro® units and sensory equipment used in this trial proved durable in harsh environmental conditions. It was found that remote monitoring of watering points could significantly reduce operating costs of the northern pastoral industry, although the set up and maintenance costs would be a major factor influencing the uptake of the technology. The time period to recoup costs was estimated to be approximately five and a half years. Industry interest in the use of this system was positive.

Document Location: Technical Annual Report 1996-97 (*Page 120-121*).

Keywords: telemetry, watering points

54. Estimating Pasture Yields through Satellite Imagery

Project Officer: C. Materne (DoR)

Project Location: Barkly Region

Date: 2000-01

Summary: The objective of the project was to develop a procedure using Landsat7 eTM satellite imagery to predict pasture biomass on the Flinders/Mitchell grasslands of the Barkly Region. It was anticipated that this would assist land managers in setting yearly stocking rates for individual paddocks and aid the prediction of animal performance and yearly profits. The program proved to be expensive and complicated, requiring specialised personnel on the stations to implement the use of the technology.

Document Location: Technical Annual Report 1999-2000 (*Page 211-212*).

Keywords: satellite imagery, pasture biomass

55. Monitoring Seasonal Variability of the Barkly Region and Newcastle Waters with NOAA AVHRR Satellite Image Time Series

Project Officer: C. de Pus (Ghent University)

Location: Newcastle Waters Station and Barkly Region

Date: 2004-05

Summary: This project was initiated to assess land degradation using satellite images, taking into account variations in land types. The study at Newcastle Waters Station aimed to assess past and present land condition not only qualitatively but also quantitatively. To this end, the potential of both low and high resolution images was explored. The ability to use the images to distinguish annual and perennial grasses was investigated. After atmospheric correction and filtering, high quality composites resulted, allowing detection of subtle differences between annual and perennial grasses. The report indicated that the process is promising but needs to be further refined, taking into consideration the spatial and seasonal variability of rainfall. The authors believed that this method would have the potential to separate the grazing impact from natural variability. The report indicates the potential value of this technology and recommends further investigation.

Document Location: de Pus, C. and Ducheyne, E. (2006). Remote Sensing in Evaluating the Environmental Impact of Rangeland Management, Final Report. DoR Library, Tennant Creek.

Keywords: land degradation, satellite images, land type

FIRE

56. Fire Management

Project Officer: G. Allan (CCNT)
Location: Alexandria Station, Brunette Downs Station and Mittiebah Station
Date: 1990-97

Summary: This project aimed to develop a monitoring and reporting methodology suited to tropical savannah ecosystems and to provide a regional overview to meet the needs of the regulatory bodies responsible for fire management. Methods incorporated NOAA satellite images processed using microBRIAN software. The data indicated that the patterns and timing of fire can provide new and significant information about the nature of fire in the Barkly.

Document Location: A preliminary report from this study was published in the proceedings of the 1994 Katherine Rangelands Conference: 'Clean Country, Clean Product, Clean Profit'.
DoR Library, Tennant Creek.

Keyword: fire

57. Alexandria Burning Trial

Project Officer: C. Materne (DoR)
Location: Alexandria Station
Date: 2001-04

Summary: The objectives of this project were to measure the impact of low intensity, late wet season fires, and high intensity dry season fires, on the Mitchell grasslands and woody plant species. The project also aimed to demonstrate the application of prescribed burning in the extensively-grazed Mitchell grasslands. Results suggest that short-term feed quality benefits at the beginning of the wet season can be achieved through controlled burning and that Mitchell grasslands recover well after burning when followed by an average rainfall season.

Document Location: 2003 Progress Report (DoR Library, Tennant Creek).
Technical Annual Report 2002-03 (*Page 104*).
Technical Annual Report 2003-04 (*Page 86-87*).
Technical Annual Report 2005-06 (*Page 3*).
Technical Annual Report 2006-07 (*Page 120*).
Technical Annual Report 2007-08 (*Page 102-107*).
The final report for this trial is due to be released in December 2010.

Keywords: fire, Mitchell grasslands, prescribed burning

EXTENSION

58. Barkly Rangeland Management Course

Project Officers: Pastoral Production Officers (DoR)

Location: Barkly Region

Date: 1999-ongoing

Summary: The Barkly Rangeland Management Course aims to improve the land management skills of employees in the region's pastoral industry. The main objective of the course is to improve participants' understanding of native pasture dynamics, plant identification and basic monitoring techniques, and stimulate their interest in pasture monitoring to assist in sustainable land management decisions. Topics include cattle nutrition, biodiversity, weeds and poisonous plants, fire and land condition.

Document Location: Technical Annual Report 2002-03 (*Page 103*).
Barkly Rangeland Management Course Manual.
DoR Library, Tennant Creek.

Keywords: native pasture, monitoring, nutrition, biodiversity, weeds, fire, land condition

59. Barkly Herd Management Course

Project Officers: Pastoral Production Officers (DoR)

Location: Barkly Region

Date: 2004-ongoing

Summary: The Barkly Herd Management Course aims to provide managers, overseers and head stockmen in the Barkly Region with up to date information about breeder herd efficiency and management, natural resource management issues, sustainable rangeland management practices, leadership and team development approaches and research outcomes as well as product marketing and consumer attitudes relating to the northern Australian beef industry.

The course provides participants with exposure to research outcomes and industry trends through the presentation and discussion of information by expert presenters, while also showcasing breeder herd management practices and providing opportunities for interaction between head stockpersons from various pastoral enterprises as well as networking with key industry professionals and representatives.

Document Location: Proceedings of the Barkly Herd Management Course 2004.
Proceedings of the Barkly Herd Management Course 2005.
Proceedings of the Barkly Herd Management Course 2007.
DoR Library, Tennant Creek.

Keywords: breeder herd efficiency, rangeland management, natural resource management

60. Mitchell Grasslands: Quality and Quantity Guide

Project Officer: C. Materne (DoR)
Location: Barkly Region
Date: 2006

Summary: The 'Mitchell grasslands: quality and quantity guide' publication was developed to provide pastoralists of the Mitchell grasslands with a visual aid for assessing pasture quality and quantity using photographic standards. In using these standards, managers are able to understand their pasture better and achieve more sustainable long-term production. The field guide comprises information on the plants' nutritional quality throughout a typical season and images depicting various states of land condition using the ABCD classification method. The booklet also provides important information on management issues, such as fire, stocking rates and hay production.

Document Location: Tennant Creek Barkly Landcare and Conservation Association Office on: (08) 8962 4494.

Keywords: Mitchell grasslands, pasture quality, land condition, fire, stocking rates

61. 'A Field Guide to Plants of the Barkly Region, Northern Territory'

Project Officers: C. Materne, A. Bubb and J. Purdie (DoR)
Location: Barkly Region
Date: 2005–07

Summary: The project's aim was to create a comprehensive field guide that could be used by pastoralists, Indigenous and non-Indigenous land managers and other interested organisations to assist in the identification of a wide range of flora species across the Barkly Tableland Region. The book contains comprehensive information on over 370 plants found in the Barkly Region, including easy to interpret descriptions of plants, their habitats, distribution maps and addition information including palatability to stock.

Document Location: Tennant Creek Barkly Landcare and Conservation Association Office on: (08) 8962 4494.

Keywords: field guide

WEEDS

62. Establishment and Persistence of Sown Native Grasses after Mechanical Control of Rubber Bush

Project Officers: F. Anderson and C. Materne (DoR)
Location: Powell Creek Station
Date: 1996-99

Summary: A demonstration trial was developed to explore the effect of mechanical soil disturbance on the establishment of sown barley Mitchell grass (*Astrelba pectinata*). An area infested with rubber bush (*Calotropis procera*) and parkinsonia (*Parkinsonia aculeata*) was mechanically disturbed using a cutter bar to a depth of 30 cm behind a bulldozer, followed by the sowing of barley Mitchell grass and stock exclusion. Barley Mitchell grass was sown in four treatments, with a further four unsown treatments remaining. The treatments included:

1. Disturbed-grazed-sown
2. Disturbed-ungrazed-sown
3. Undisturbed-grazed-sown
4. Undisturbed-ungrazed-sown
5. Disturbed-grazed-unsown
6. Disturbed-ungrazed-unsown
7. Undisturbed-grazed-unsown
8. Undisturbed-ungrazed-unsown

Grazing was excluded by erecting a fence around a disturbed and undisturbed treatment area. Mitchell grass densities decreased after initial establishment due to grazing and competition with the native forbs and grasses already present in the area. The results showed a sharp increase in rubber bush densities on all disturbed soil sites, especially on the disturbed and ungrazed sites. Initial results indicated that mechanical control was ineffective, and may have in fact exacerbated the problem.

Document Location: Technical Annual Report 1998-99 (Page 164-165).

Keywords: Mitchell grass, rubber bush, parkinsonia

63. Biological Control of Parkinsonia

Project Officers: N. Ostermeyer, B. Lukitsch, G. Flanagan and S. Wingrave (DoR)
Location: Barkly Region
Date: 1997-ongoing

Summary: The aim of this project was to investigate the efficacy of two biological control methods in the management of parkinsonia (*Parkinsonia aculeata*). Two species of pod-feeding beetles were established on the weed in the Roper River catchment, the Barkly Region and the Victoria River District. Surveys indicated that the agents had spread up to 99 km from the release site and were destroying up to 87% of seeds.

Document Location: Technical Annual Report 1997-98 (Page 199).
Technical Annual Report 1998-99 (Page 160).
Technical Annual Report 2000-01 (Page 241).

Keywords: parkinsonia, biological control

64. Survey and Control of Class B Noxious Weeds

Project Officers: A. Gracie, J. McMahon and J. Peart (DoR)
Location: Barkly Region
Date: 1999-ongoing

Summary: The aim of this program was to document the existence of Class B noxious weeds in the Barkly Region and then implement targeted control programs. Initially, this involved liaising with land managers to efficiently conduct ground based surveys, mapping and monitoring of infestations. The integrated management of parkinsonia (*Parkinsonia aculeata*) continued at strategic locations. Ground management of noogoora burr (*Xanthium occidentale*, now referred to as *X. pungens*) continued on Helen Springs, Alexandria, Epenarra and Rocklands stations. Rubber bush (*Calotropis procera*) was controlled and contained at various locations throughout the Barkly. Integrated mesquite (*Prosopis pallida*) control on Brunette Downs, Austral Downs, Alroy Downs and Lake Nash was able to significantly reduce the number of plants.

Document Location: Technical Annual Report 2000-01 (Page 237-238).

Keywords: weeds, parkinsonia, noogoora burr, rubber bush, mesquite

65. Biological Control of Mexican Poppy, Bellyache Bush, Mesquite and Hyptis

Project Officers: N. Ostermeyer, B. Lukitsch, B. Hennecke, G. Flanagan and J. McMahon (DoR)
Location: Barkly Region
Date: 2000

Summary: CSIRO Quarantine Laboratories reared species of leaf feeding beetles (*Colaspis* sp.) and the longicorn beetle (*Lagocheirus* spp.) for the biological control of bellyache bush (*Jatropha gossypifolia*). Exploration for biocontrol agents, and preliminary studies in Mexico for both Mexican poppy and bellyache bush continued in Central America and the Caribbean.

The mass rearing and release programs of two biological agents for the control of Mesquite continued. The biological control agent, *Evippe* sp. #1 established at three sites with the best results at Alroy Downs, where plant damage was between 50-80% within 5 km of release sites. The agent was redistributed from Alroy Downs to new release sites. Difficulty was encountered in successfully establishing the sap-sucking psyllid, *Prosopidopsylla flava*, following mass releases of 17 000 insects in the Alroy Downs area in March, April and May, 2000.

Work into potential biological control agents for hyptis was restarted during 2000. Two surveys were conducted during 2000 and a weevil from Venezuela was identified as being a potential agent and was sent away for identification. Research is continuing in different parts of the world, though no solid results are available at the time of publishing.

Document Location: Technical Annual Report 2000-01 (Page 241-242).

Keywords: bellyache bush, Mexican poppy, mesquite, hyptis

66. Control Programs of Parkinsonia on Newcastle Creek and Longreach Waterhole

Project Officer: Barkly Landcare Facilitator
Location: Newcastle Waters Station (Longreach Waterhole Reserve)
Date: 2000-ongoing

Summary: The Barkly Landcare and Conservation Association together with Consolidated Pastoral Company completed a riparian restoration project at Newcastle Creek and Longreach waterhole, a wetland of national significance. Parkinsonia (*Parkinsonia aculeata*) was chemically controlled on an area of 700 hectares and a field day was conducted to showcase the weed management work to the public.

Document Location: Northern Territory Cattlenews, Vol 7 No.3 August 2004, view at http://www.ntca.org.au/assets/cattlenews_0408.pdf

Keywords: parkinsonia, weeds

67. Biological Control of Senna

Project Officers: N. Ostermeyer and B. Hennecke (DoR)
Location: Barkly Region
Date: 2000

Summary: Two sites were identified for the biological control of senna (*Senna planitiicola*) and to conduct ecological studies prior to the release of biological control agents. One potential agent for senna failed the host specificity test and was consequently rejected.

Document Location: Technical Annual Report 2000-01 (Page 242).

Keywords: senna

68. Eradication of Class A Noxious Weeds

Project Officers: J. McMahon and J. Peart (DoR)

Location: Barkly Region

Date: 2000-ongoing

Summary: Isolated infestations of the noxious weed prickly acacia (*Acacia nilotica*) occur in the NT. The management of this weed involves the removal of mature plants and the continued control of seedlings. Ongoing control programs have reduced the number of seedlings emerging at both Barkly locations and reduced its potential damage to the cattle industry.

Document Location: Technical Annual Report 2000-01 (Page 237).

Keywords: prickly acacia, weeds

69. Strategic Management of *Parkinsonia aculeata* in the Georgina River Catchment - NT

Project Officer: N. Wilson (BLCA)

Location: Georgina River Catchment (Barkly Tableland)

Date: 2008

Summary: The Barkly Landcare and Conservation Association, the NT Nature Resource Management Board and 11 pastoralists worked cooperatively on a project that investigated the strategic management of *Parkinsonia aculeata* in the Georgina River Catchment area on the Barkly Tableland. As a weed of national significance, parkinsonia degrades riparian zones, restricts stock access to water and can cause severe erosion. As part of the project, several steps were undertaken to ensure adequate education on parkinsonia control, including running workshops on best practice management strategies, including how to integrate weed management with everyday property management plans, mapping severe infestation sites and establishing monitoring sites. Ten year weed management plans were also developed for each of the 11 properties involved with each plan addressing prevention and early intervention for new incursions, eradication of existing infestation and ongoing land management practices. Although the project was run throughout 2008, the changes in pasture and vegetation around heavily infested sites are hard to measure over such a short period of time; therefore, monitoring of designated sites will continue through to December 2010.

Document Location: Barkly Landcare and Conservation Association website link
<http://www.barklylandcare.org.au/4-Projects.html>

Keywords: parkinsonia, weeds

70. Distribution, Invasiveness, Biology and Control of Rubber Bush (*Calotropis procera*) in Northern Australia

Project Officer: S. Campbell (QDEEDI)

Location: Western Barkly

Date: 2010-14

Summary: This project arose from concern expressed by the Barkly Regional Advisory Committee in 2007 that rubber bush was rapidly spreading across the western Barkly. A workshop held at Helen Springs in June 2007, attended by Barkly Region producers and researchers from a wide range of agencies, concluded that rubber bush had the potential to permanently change the nature of the open tablelands and adversely affect cattle production and management. It was agreed that current options for cost-effective control were limited by a poor understanding of the biology of the plant.

A follow up meeting in Darwin in January 2010 resulted in MLA funding a four-year research program to improve understanding of the distribution, rate of spread, reproductive biology and invasiveness of rubber bush. This research will enable more strategic, effective and cost-efficient methods of control, and identify management strategies to reduce future economic costs to industry from unchecked increases in rubber bush spread and density.

This collaborative project will be conducted in the NT and Queensland by QDEEDI, DNRETAS and CDU, with assistance from DoR and the Barkly Landcare and Conservation Association.

Document Location: DoR office, Tennant Creek.

Keywords: rubber bush

BIODIVERSITY

71. Biological Survey of Connell's Lagoon Conservation Reserve

Project Officers: Johnson, P. Latz and M. Fleming (CCNT)

Location: Connells Lagoon

Date: 1982

Summary: One hundred and eighty nine species of plants were identified during the 1982 survey of Connells Lagoon Conservation Reserve. Nine mammal species, 53 bird and 19 reptile species were also recorded. Some bird species considered endangered were recorded in higher numbers than expected.

Document Location: Parks and Wildlife Commission NT Report.

http://www.nt.gov.au/nreta/parks/find/pdf/ConnellsLagoon_000.pdf
DoR Library, Tennant Creek.

Keywords: mammal, reptiles, birds

72. The Conservation Status of Birds in Arid Australia: Barkly

Project Officers: J. Reid and M. Fleming (CCNT)

Location: Barkly Region

Date: 1980s

Summary: This study was initiated when it was identified that there was little information on the conservation status of birds in the Australian rangelands. Thirteen species of birds were identified as having declined in numbers; however, no species had become extinct. Some 220 to 230 species were considered to be regular inhabitants of the arid zone. It appeared that vegetation change resulting from overgrazing by exotic herbivores had been the principal cause of the decline of bird species within the arid zone. Predation by foxes and cats may have played an additional but secondary role in the decline of many species. Altered fire regimes did not seem to have had a direct impact. Analysis showed that birds of grassy riparian environments and chenopod shrub lands had been most affected. The canopy-feeding species in these habitats had not appeared to have been as severely affected, further indicating that grazing pressure was the primary factor. The recommendation that pastoral management must focus on maintaining or improving the health of perennial plant species, both pasture species and other important character-species, was an outcome of the study. Grazing management needs to be particularly sensitive under drought conditions as this is the most stressful period for Australia's desert biota. In addition, total grazing pressure needs to be evaluated and managed. The study concluded that feral horses, donkeys, goats, pigs, kangaroos and particularly rabbits require effective control when abundant.

Document Location: Reid, J. and Fleming, M. (1992). The conservation status of birds in arid Australia, *Rangeland Journal*, **4, 2**: 65 – 91.

DoR Library, Tennant Creek.

Keywords: rangelands, birds, fire regimes, grazing management

73. Diet of the Feral Cat

Project Officers: R. Paltridge and D. Gibson (CSIRO) G. Edwards (DNRETAS)

Location: Barkly Region

Date: 1990-94

Summary: This project was prompted by the loss of 16 native mammal species to extinction and the 1990 findings that a further 15 species had declined significantly. Between 1990 and 1994, the stomach contents of 390 feral cats were collected from Brunette Downs to Lake Nash. Analysis of the stomach contents showed that cats fed on a wide variety of invertebrates, reptiles, birds and mammals, including animals up to their own body mass in size. Mammals were the most important prey, contributing up to 90% of the total mass of stomach contents. Reptiles were regularly eaten in summer and birds were important in winter. Invertebrates were present in the diet in all seasons. Carrion appeared in stomach samples during dry winters only and this has implications for future control of feral cats. Cats were recorded taking beef baits containing 1080 laid for dingoes during this period. These observations suggest that the appropriate time to conduct a baiting program for control of feral cats in Central Australia is when cats are nutritionally stressed. The report states that contrary to the view that dingoes may suppress cat numbers, in some situations dingoes may actually assist the survival of cats by providing food that can be scavenged.

Document Location: R. Paltridge, D. Gibson and G. Edwards (1997). *Wildlife Research*, CSIRO Publishing, Vol 24 no 1, pp. 67-76.
DoR Library, Tennant Creek.

Keywords: mammal, feral cats, reptiles, birds, dingoes

74. The Ecology of Ephemeral Wetlands of the Sub-Humid Tropics

Project Officer: M. Fleming (DNRETAS)

Locations: Barkly Region and Victoria River Region NT, Kimberley WA, Downs and Channel Country, Qld.

Date: 1991-93

Summary: The study sought to test the hypothesis that ephemeral wetlands within the subhumid tropics of northern Australia are a habitat for the conservation of national waterbird populations. Satellite images were used to provide continent-wide mapping of wetlands and ground based surveys were conducted to ground truth the satellite images. Ephemeral wetlands of the sub-humid tropics lie in a broad belt across northern Australia between the true monsoonal belt and the arid zone. These wetlands are areas of internal drainage that fill infrequently but often enough to carry a distinctive plant community. When filled, they become a rich food resource for waterbirds. This study showed that the monitoring of ephemeral wetlands by satellite imagery is feasible at the national level and that ephemeral wetlands make a significant contribution to waterfowl populations at the continental level. The report stated that provision of this information to property managers could facilitate the protection of ephemeral wetlands and the best mechanism for distribution would be through the state agencies involved in the implementation of ecologically sustainable pastoral management.

Document Location: Fleming, M. (1993). *The Ecology of the Ephemeral Wetlands of the Sub Humid Tropics*. Report to the Conservation Commission of the NT.

Keywords: ephemeral wetlands, waterbird, satellite images

75. Waterbird Conservation Values of Ephemeral Wetlands

Project Officers: R. Jaensch and K. Bellchambers (Wetlands International- Oceania)
Location: Alroy Downs Station, Anthony Lagoon Station, Brunette Downs Station, Eva Downs Station, Newcastle Waters Station, Rockhampton Downs Station
Date: 1995

Summary: Surveys of waterbird usage of 30 wetlands on the Barkly black-soil plains were conducted in January, February, March and May 1995. The surveys were performed from the ground and from a helicopter on wetlands that were representative of those found in the Barkly Region. Sixty waterbird species were recorded and substantial information on waterbird usage of the Barkly wetlands was obtained. The great reed-warbler was recorded in the area for the first time. The freckled duck, which is a nationally threatened species, was recorded at eight wetland locations. The arrival of six species in considerable numbers was documented more than a month before any lakes or swamps started filling. Magpie geese and a number of other species began laying eggs less than 21 days after the lakes started to fill. For six species, the number of birds counted in 1995 was the highest ever recorded in the Barkly wetlands. It was recorded that approximately 90 000 waterbirds were present in the study area in May 1995, with the highest numbers (28 600) at Lake Sylvester. The high value of the Barkly wetlands for waterbird conservation exists under a regime of pastoral grazing of cattle, which has been maintained for up to 100 years. It was recommended that the NT Government establish a consultation process with pastoral managers to determine strategies that will maintain the demonstrable values of the wetlands for waterbirds.

Document Location: Jaensch, R. P. and Bellchambers, K. (1997). Waterbird Conservation Values of Ephemeral Wetlands of the Barkly Tableland, Final Report to the Australian Heritage Commission, Parks and Wildlife Commission of the Northern Territory, Darwin.
DoR Library, Tennant Creek.

Keywords: waterbird, wetlands, conservation

76. Biogeography of Birds and Plants in Chenopod Shrublands

Project Officer: C. Brock (NTU)
Location: Barkly Region
Date: 1999-2000

Summary: This study sought to describe the variability in groups of birds and plants occurring in swamps in the Barkly Tableland of the NT that support the shrub northern bluebush (*Chenopodium auricomum*). A total of 165 plant species and 72 bird species were recorded from a total of 45 sample sites. Inundation and season contributed to different bird types featuring more predominantly at different times of the year. Bluebush dependent species remained mostly constant throughout the year, emphasising the value of bluebush as a core habitat for these species. Significant rainfall is usually spatially patchy across the region in any year and therefore resources available to birds may be widely dispersed. Such uncertainty in resources may preclude species from being too specialised on a particular resource; therefore, there is less chance of bird species being bluebush specialists, given the patchy distribution of the habitat in the region.

While bluebush itself is generally resilient to grazing effects, a number of the rarely recorded plant species that were located during this study may need to be protected from heavy grazing pressure. However, the grazing of bluebush is not uniform across the region and is not always highly grazed. Its growth form and lignotuber-like stump mean that *C. auricomum* will re-sprout from a basal stump to a full size plant given sufficient rainfall, even after heavy grazing. Therefore, the condition of bluebush swamps can be expected to vary through a complex interaction of factors, including position in the landscape, swamp size, distance from water, climatic conditions and stocking densities.

Document Location: Brock, C. (2000). Biogeography of Birds and Plants in Chenopod Shrublands in the Barkly Tableland, Northern Territory, (Thesis).
DoR Library, Tennant Creek.

Keywords: northern bluebush, birds

77. Biograzing - Waterpoints and Wildlife

Project Officers: C. James (CSIRO)
A. Fisher (DNRETAS)
Location: Barkly Region NT and Kingoonya Region, SA
Date: 2000

Summary: The Biograzing project was a collaborative effort involving CSIRO's Sustainable Ecosystems, the Pastoral Board of South Australia, the South Australian Department for Environment and Heritage, the Parks and Wildlife Commission of the NT and land managers in the respective regions. This project developed a booklet outlining how biodiversity conservation can be integrated with grazing in the dry rangelands in order to preserve Australia's plants and animals, as well as to create a green marketing advantage for industry. Most native species appear to be surviving well in grazed rangeland areas, but a significant number of decreaser species are vulnerable to the effects of further water point developments. Also covered in the booklet are ways to plan future development in rangeland regions in order to maintain decreaser species.

Document Location: Biograzing Waterpoints and Wildlife. Final Project Report, November 2000, CSIRO.
<http://savanna.cdu.edu.au/downloads/biograzing.pdf>
DoR Library, Tennant Creek .

Keywords: biodiversity, conservation, rangelands, decreaser species

78. Aerial Survey of Wetlands and Waterbirds in the Barkly

Project Officer: R. Jaensch (Wetlands International- Oceania)

Location: Barkly Region

Date: 2001, 2002, 2006

Summary: The primary purpose of this work was to develop an understanding of the conservation value of Barkly wetlands and to provide data for estimates of waterbird population sizes in Australia. Major findings were that the lakes collectively and, in many cases individually, can support significant numbers of waterbirds when extensively inundated. The wetlands support a number of breeding colonies of waterbirds (ibis, egret, cormorant, pelican, and tern) and a substantial numbers of migratory shorebirds that breed in Asia.

Document Location: Reid, J., Potts, R., Ziembicki, M. and Jaensch, R. (2006). Aerial survey of waterbirds in the northern Tanami Desert, Wetlands International.
<http://www.wetlands.org/LinkClick.aspx?fileticket=w1r49rOYjkg%3d&tabid=56>

Keywords: conservation, wetlands, waterbird

79. Wetlands of the Arid NT: Inventory and Significance

Project Officers: A. Duguid, J. Barnetson, B. Clifford, C. Pavey, D. Albrecht, J. Risler and M. McNellie (Parks and Wildlife Commission of the NT)

Location: Arid Southern NT, south of latitude 20°S.

Date: 2002

Summary: This two year study aimed to document the birds, fish and plants of the region and the significance of various wetlands. A diverse array of wetland types were described, including permanent, temporary, saline and fresh water wetlands. The occurrence and increasing infestation of introduced grasses and other seeds were confirmed as the major threat to natural values of wetlands in the study area. Human alterations to hydrological regimes, such as water diversions and draining, appeared to have had little impact at that time.

Document Location: Report to Environment Australia 2002.
DoR Library, Tennant Creek.

Keywords: wetlands, birds, fish

80. Ecology of the Australian Bustard

Project Officer: M. Ziembicki (DNRETAS)

Location: Barkly Region

Date: 2003-06

Summary: This study intended to gain general information on habits and habitat of the bustard in northern Australia by monitoring movements and population dynamics. Although bustards are seen to be nomadic species, information from this study suggests that bustards seldom make random movements. Ground surveys revealed that abundance peaks in the late dry and early wet season. Bustards exhibit a distinct preference for open plains in the non breeding season and tend to use a variety of habitats during the breeding season.

Document Location: M. Ziembicki, D. Paton and J. Woinarski (2006). Ecology and Conservation of the Australian Bustard in Northern Australia, Final Report.
DoR Library, Tennant Creek.

Keywords: bustard, population dynamics

SURVEYS

81. The Barkly Beef Industry Survey 1980

Project Officers: R. Holt and J. Bertram (DoR)

Location: Barkly Region

Date: 1980

Summary: This report was the first comprehensive study of the NT Barkly Tableland cattle industry. It was based on a personal face to face survey conducted by officers of the Department of Primary Production. Twenty two of the 25 cattle stations in the Barkly Tableland district were surveyed. These stations carried an estimated 439 230 cattle representing 25% of the estimated cattle population of the NT. At the same time, these stations turned off 119 306 sale cattle in 1980 equating to 26% of the NT turn-off. Managers felt the district could potentially carry 46% more cattle than the estimated 1980 population. It was envisioned that higher cattle numbers would be achieved by further developing the stations with additional bores, fences and yards. The level of husbandry appeared higher in the Barkly district than in the adjacent regions. Limited research or extension work had been carried out in the district to assist the cattle industry, with the notable exception of the animal health field. In the survey, managers detailed problems in the district and indicated what they perceived the role of the NT Department of Primary Production in the region.

Document Location: Holt, R. and Bertram, J. (1981). The Barkly Tableland Beef Industry 1980, Department of Primary Production, Technical Bulletin 41.
DoR Library, Tennant Creek.

Keyword: survey

82. Australian Agricultural and Grazing Industries Survey: NT Regional Results

Project Officer: V. Rodriguez (DoR)
Location: NT-wide
Date: 2004

Summary: The objective of the project was to provide sufficient information about the four NT regions to enable the NT Government to analyse regional specific issues. It included information from the Australian Bureau of Agricultural and Resource Economics, comprising regional estimates based on the expanded sample provided for the 2000-01, 2001-02 and 2002-03 financial years.

Document Location: Rodriguez, V. (2004). Australian Agricultural and Grazing Industries Survey, Northern Territory Regional Results, Department of Business Industry and Resource Development.
DoR Library, Tennant Creek.

Keyword: grazing survey

83. Pastoral Industry Survey NT 2004: Barkly

Project Officer: A. Bubb (DoR)
Location: NT-wide
Date: 2004, published 2006

Summary: The Pastoral Industry Survey of 2004 was conducted to capture a snapshot of the management practices in the Barkly Region. This was a component of an NT-wide project, which involved the same survey with pastoralists in the Darwin, Katherine and Alice Springs Regions. This was the first such survey carried out on the Barkly since that of Holt and Bertram in 1980. The survey was based on 24 face to face interviews with pastoralists from the Barkly Region. The findings of the survey were published in 2006. The topics covered in the survey included station size and ownership structure, turn-off and markets, cattle management, land management, grazing management and business management.

Document Location: DoR, Tennant Creek Office.

Keywords: survey, management practices, grazing management

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ACRONYMS

AACO	Australian Agricultural Company
BCS	Body Condition Score
BEF	Bovine Ephemeral Fever
BLCA	Barkly Landcare & Conservation Association
BVD	Bovine Viral Diarrhoea
CCNT	Conservation Commission of the Northern Territory
	CSIRO Commonwealth Scientific and Industrial Research Organisation
DLPE	Department of Lands, Planning and the Environment
DoR	Department of Resources (<i>formerly: Department of Primary Industry, Fisheries and Mines, Department of Regional Development, Primary Industries, Fisheries and Resources</i>)
DNRETA	Natural Resources, Environment and the Arts
EBV	Estimated Breeding Value
ELISA	Enzyme Linked Immunosorbent Assay (test)
GIS	Geographic Information System
GU	Ghent University
IBR	Bovine Rhinotracheitis
ICI	Inter-conception Interval
JCU	James Cook University
NIRS	Near Infrared Reflectance Spectroscopy
NOAA	National Oceanic and Atmospheric Administration
NTU	Northern Territory University
PDS	Producer Demonstration Site
PTIC	Pregnancy Tested in Calf
QDEEDI	Queensland Department of Employment, Economic Development and Innovation
UQ	University of Queensland
VRD	Victoria River District

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