

# An innovative approach to derive long-term carrying capacity estimates for extensive grazing properties in Queensland

Giselle L. Whish<sup>A,C</sup> and Chris Holloway<sup>B</sup>

<sup>A</sup> Department of Agriculture and Fisheries, PO Box 102, Toowoomba, Qld 4350.

<sup>B</sup> Department of Agriculture and Fisheries, GPO Box 267, Brisbane, Qld 4001.

## Introduction

The extent that stocking rates are aligned with long-term carrying capacity (LTCC) has a major impact on resource condition, livestock production and grazing enterprise viability. Hence, knowledge of carrying capacity is essential to sustainable and productive use of Queensland's grazing lands. Calculating the number of animals that can be carried on a land system, paddock or property in the long-term (20 – 30 years) without any decrease in land condition requires estimation of forage production and a 'safe' level of forage utilisation. The GRASP pasture production model (McKeon *et al.* 2000) has been used extensively to estimate LTCC across a wide range of climate and land types in northern Australian rangelands. An innovative approach that uses the GRASP model and GIS technology to provide long-term carrying capacity information for extensive grazing properties in Queensland is described.

## Methods

Infrastructure (e.g. fences, water points), land types and foliage projective cover (FPC) are spatially defined; historical climate records are accessed; and areas grazed by stock based on distance to water are calculated for a property. The Cedar version of the GRASP model is used to simulate land type pasture growth for 15 FPC classes over a 100-year period. Calculation of long-term stocking rates (pasture growth x utilisation / animal intake) for tree cover and land condition is consistent with the Grazing Land Management (GLM) and Stocktake extension programs (see [www.futurebeef.com.au](http://www.futurebeef.com.au)). Long-term stocking rates are linked with spatial data (infrastructure, FPC, land type) to derive 'Potential' (land type x tree cover class) and 'Actual' (land type x tree cover class x distance to water) LTCC information for a property using the ArcGIS spatial software.

## Results and discussion

This innovative approach was recently used to provide LTCC information (tables and maps) for 20 grazing properties in Queensland (Whish *et al.* 2016). Carrying capacity estimates were greatly improved through the adjustment of model parameters to account for location and property-specific information. LTCC information can assist managers of extensive grazing properties in their planning and decision making.

## References

- McKeon GM, Ash AJ, Hall WB, Stafford-Smith M (2000) Simulation of grazing strategies for beef production in north-east Queensland. In 'Applications of seasonal climate forecasting in agricultural and natural systems – The Australian experience.' (Eds G Hammer, N Nichols and C Mitchell) pp. 227–52. (Kluwer Academic Press: Netherlands.)
- Whish G, Pahl L, Holloway C (2016) Stage 1 – NRM SPATIAL HUB – underpinning better management decisions in the Rangelands INNOV-068-SISR-DAFF. Final Report. Department of Agriculture and Fisheries, Brisbane, Queensland.

<sup>C</sup>Corresponding author: [giselle.whish@daf.qld.gov.au](mailto:giselle.whish@daf.qld.gov.au)