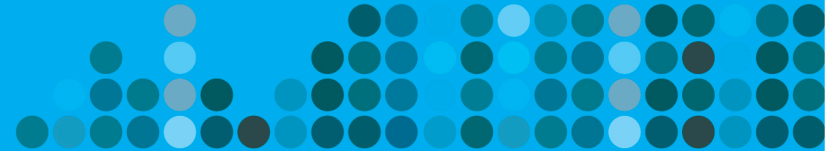


Bioeconomic modelling: do we have the complete picture?

Megan Star, Peter Donaghy & John Rolfe

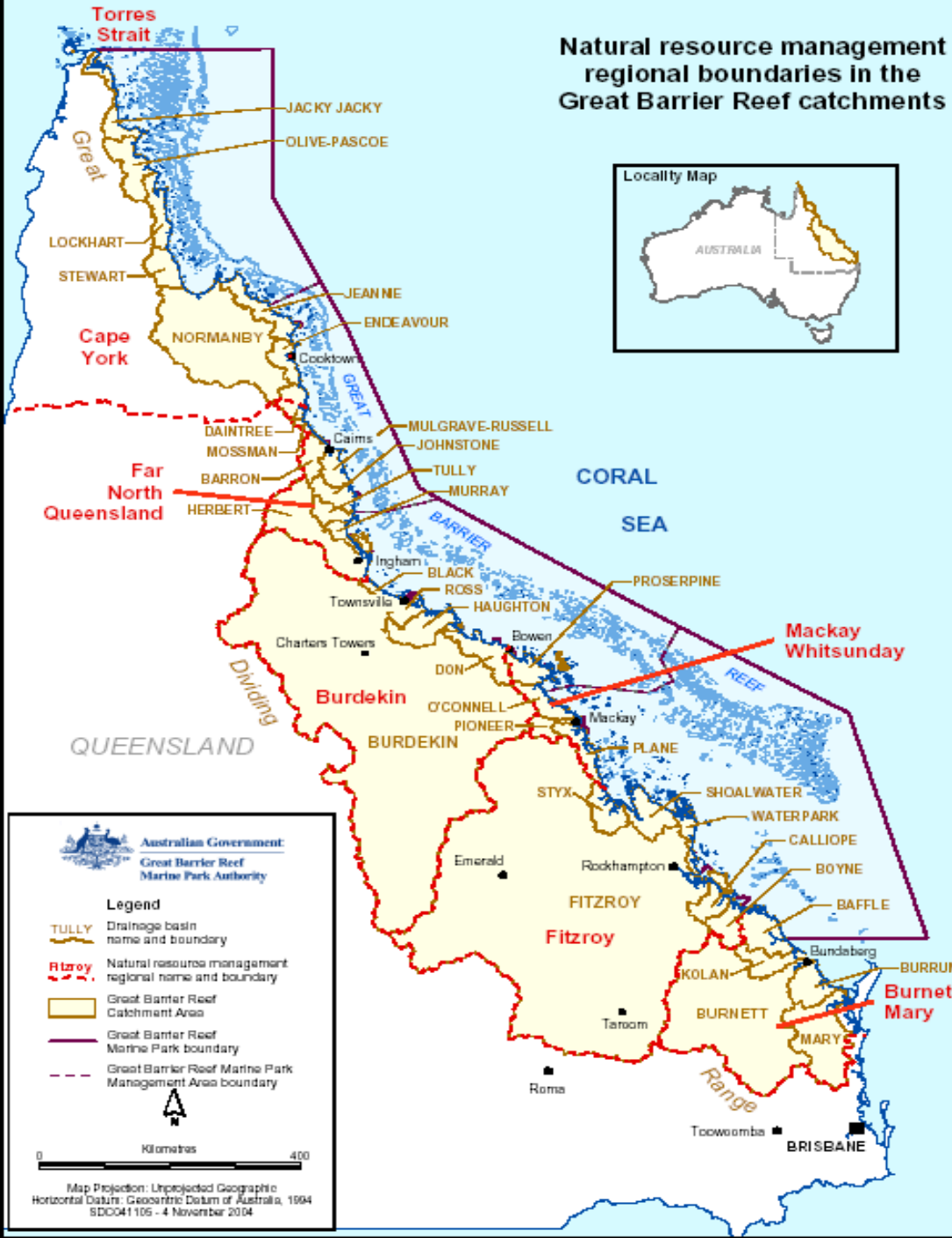




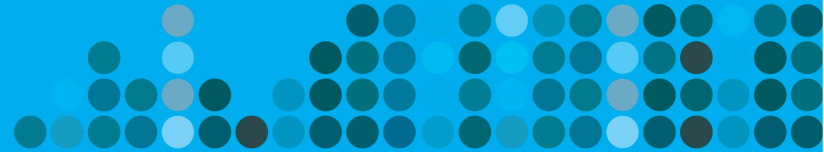
Natural resource management regional boundaries in the Great Barrier Reef catchments



Fitzroy Basin



Source:
GBRMPA



Previous NRM programs have not been as effective

- Focus has been on inputs rather than outcomes
- Lack of prioritisation in project selection
- Hard to predict combinations of biophysical and economic outcomes
- Locally specific knowledge is required

Objective of study - Bioeconomic Modelling

- To identify sediment reductions for water quality improvements at least cost
- To estimate the trade-offs between production and sediment exported from grazing lands
- Estimate \$/T of sediment reduced
- To explore GRASP's robustness for pasture modelling to be integrated into a bioeconomic model



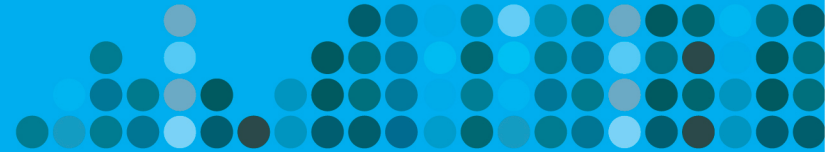
GRASP

- Only rangelands pasture modelling program available
- Predominately used for pasture modelling:
 - Stocking rates
 - Pasture species
 - Biophysical interactions
- Used for modelling such as:
 - Garnaut Climate Change Review
 - Numerous MLA projects



Bioeconomic modelling for this study

- GRASP- point based pasture modelling program
- 20 X 20 years
- % pasture utilisation- Total Standing Dry Matter (TSDM)
- Carrying capacity, live weight gain, mortalities
- Stock flow
- Selling, buying, drought feeding, drought selling.



Variables used in the study

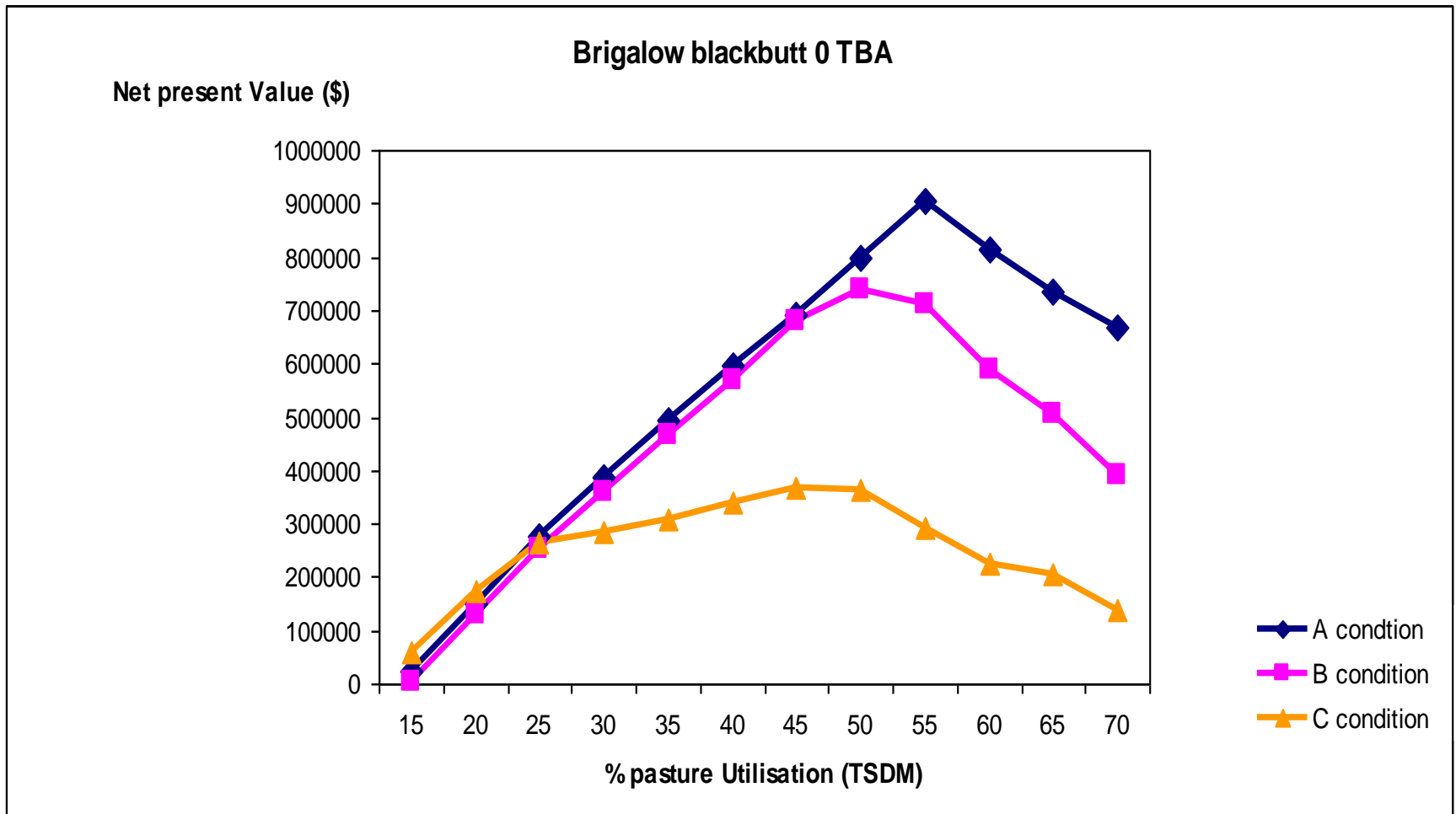
Land Types	Brigalow Blackbutt	Narrow leaved ironbark woodlands
Starting Condition	A,B,C	A,B,C
Tree Basal Area (m ²)	0 & 3	0 & 9
Grazing Pressure % TSDM	15,20,25,30,35,40 45,50,55,60,65,70	15,20,25,30,35,40 45,50,55,60,65,70



Results

- The impact of land type on production
- The impact of land condition on net present value (NPV) and sediment exported
- The impact of tree basal area
- Implications for policy
- Focus of this paper are lessons for use of GRASP in bioeconomic modelling

Impact of start condition on NPV



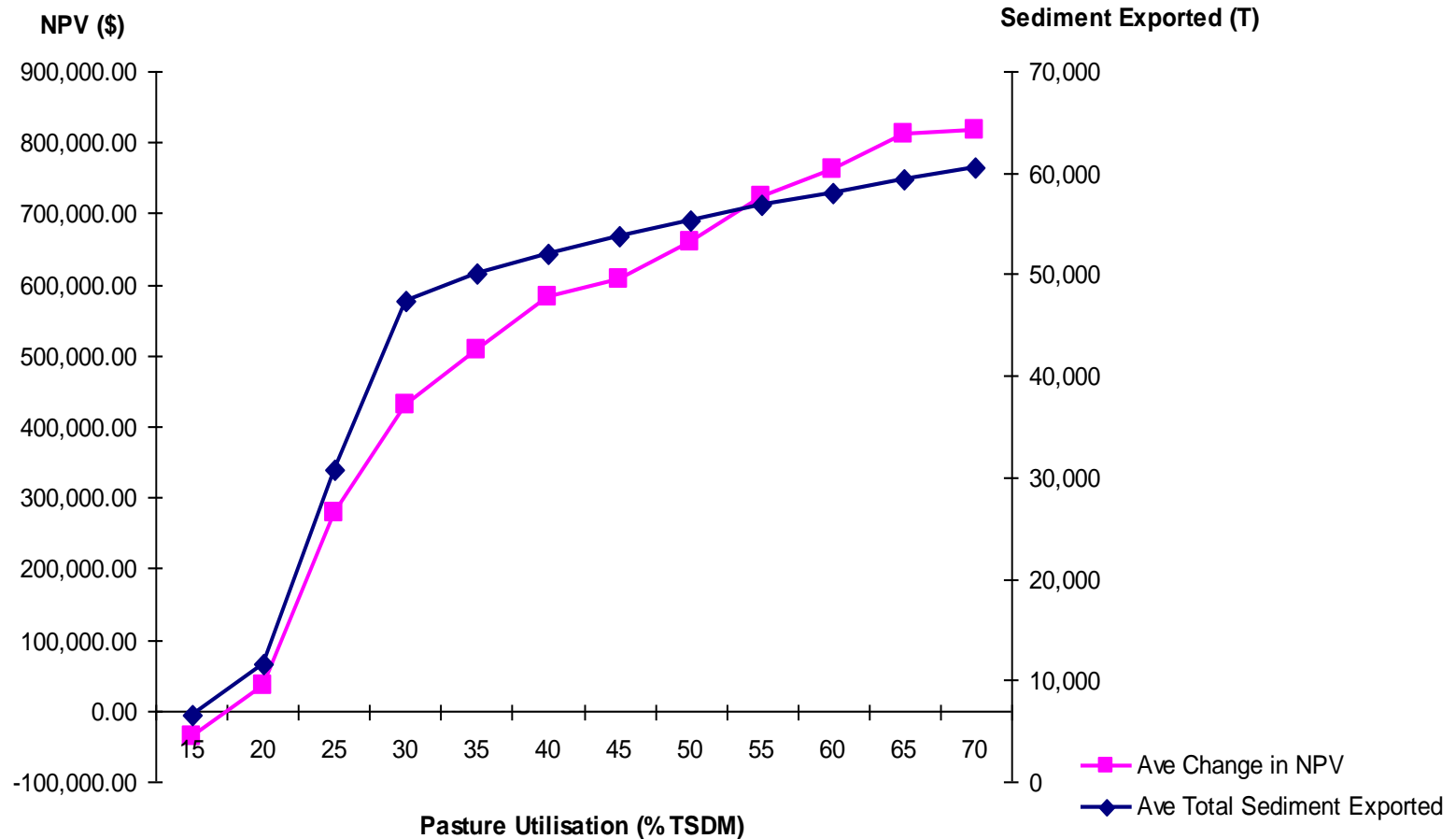


Issues with GRASP

- GRASP is not transparent
- Ability to interpret outputs
- Narrow field trials used to verify data
- Arbitrary decision rules are in-built
- Limited verification of the building blocks of the model

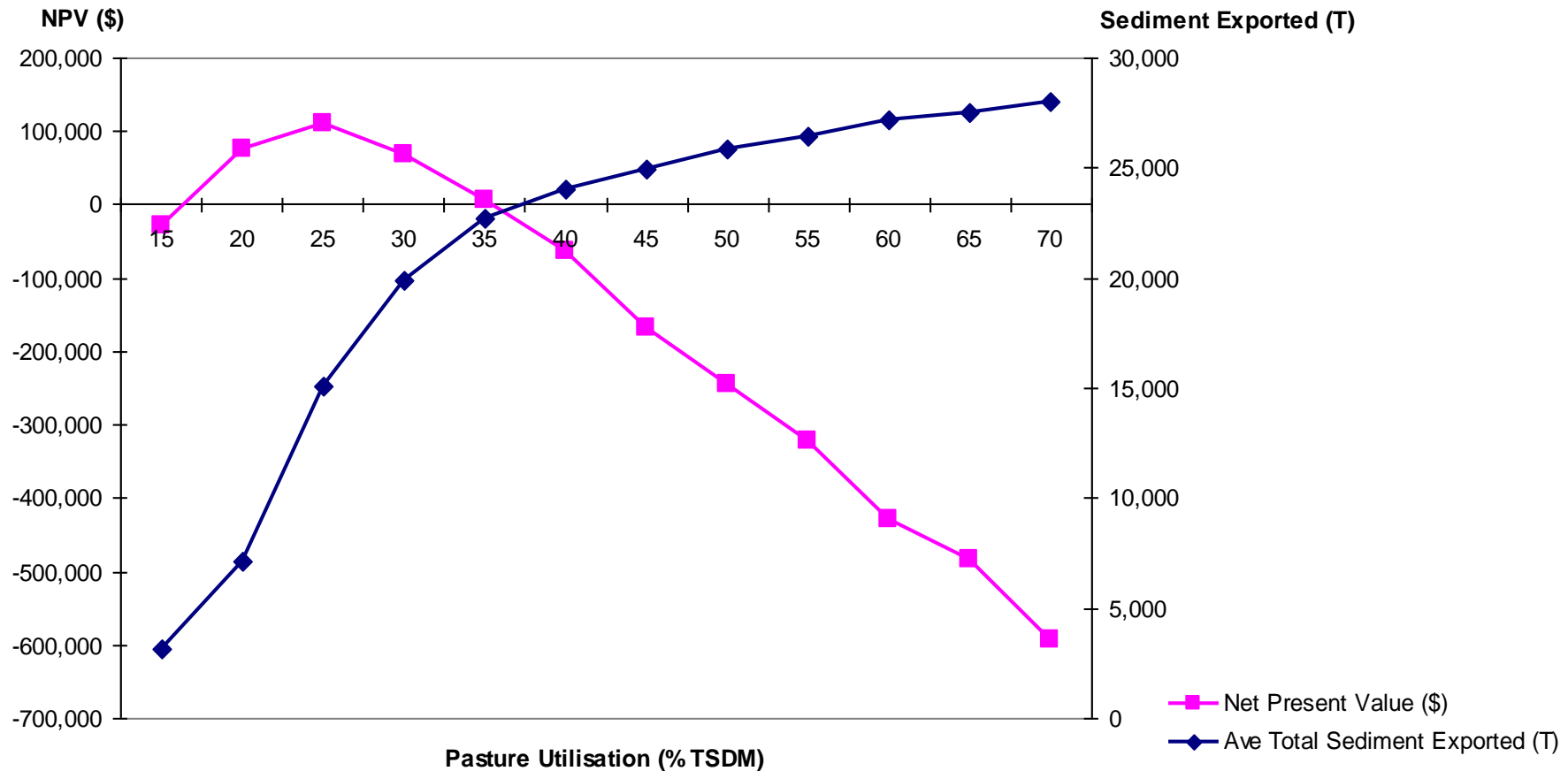
GRASP Problem 1 – insensitivity to increased stocking

Narrow Leaved Ironbark Woodlands B start condition 0 tree basal area-Galloway Plains
Calliope

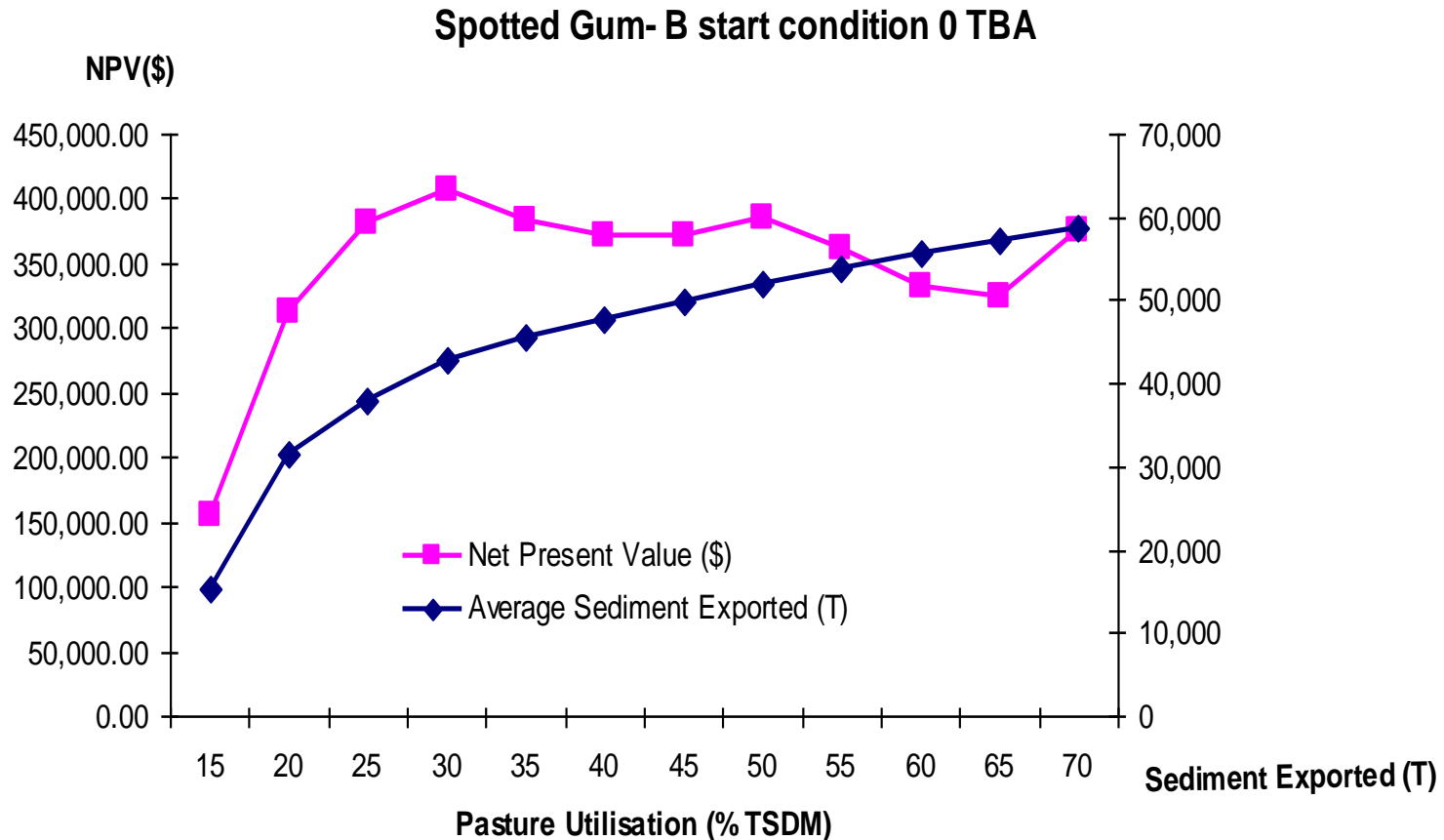


GRASP problem 2 – undue sensitivity to climate factors for NLIB woodlands

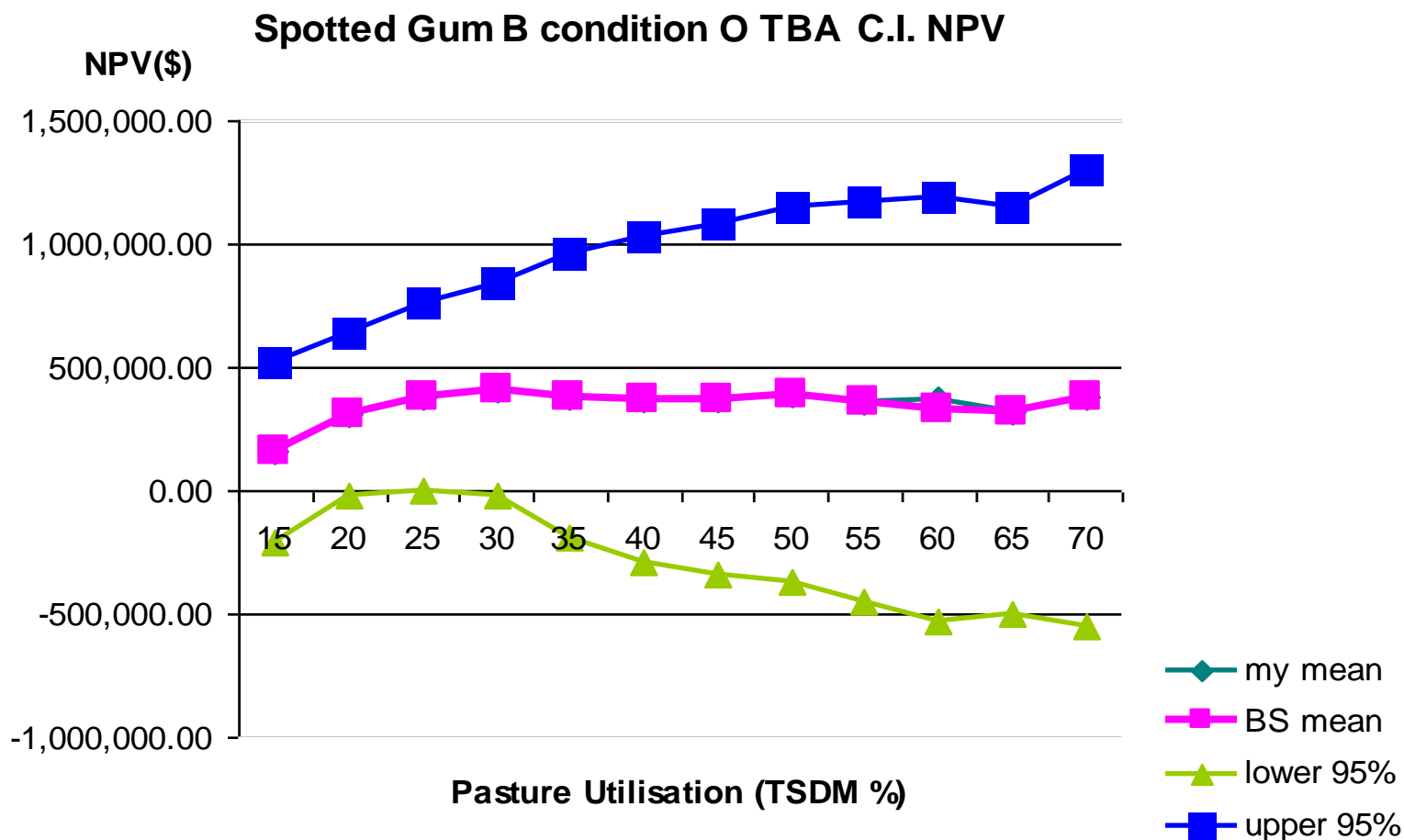
Narrow Leaved Ironbark Woodlands B start condition 0 tree basal area- Blackwater



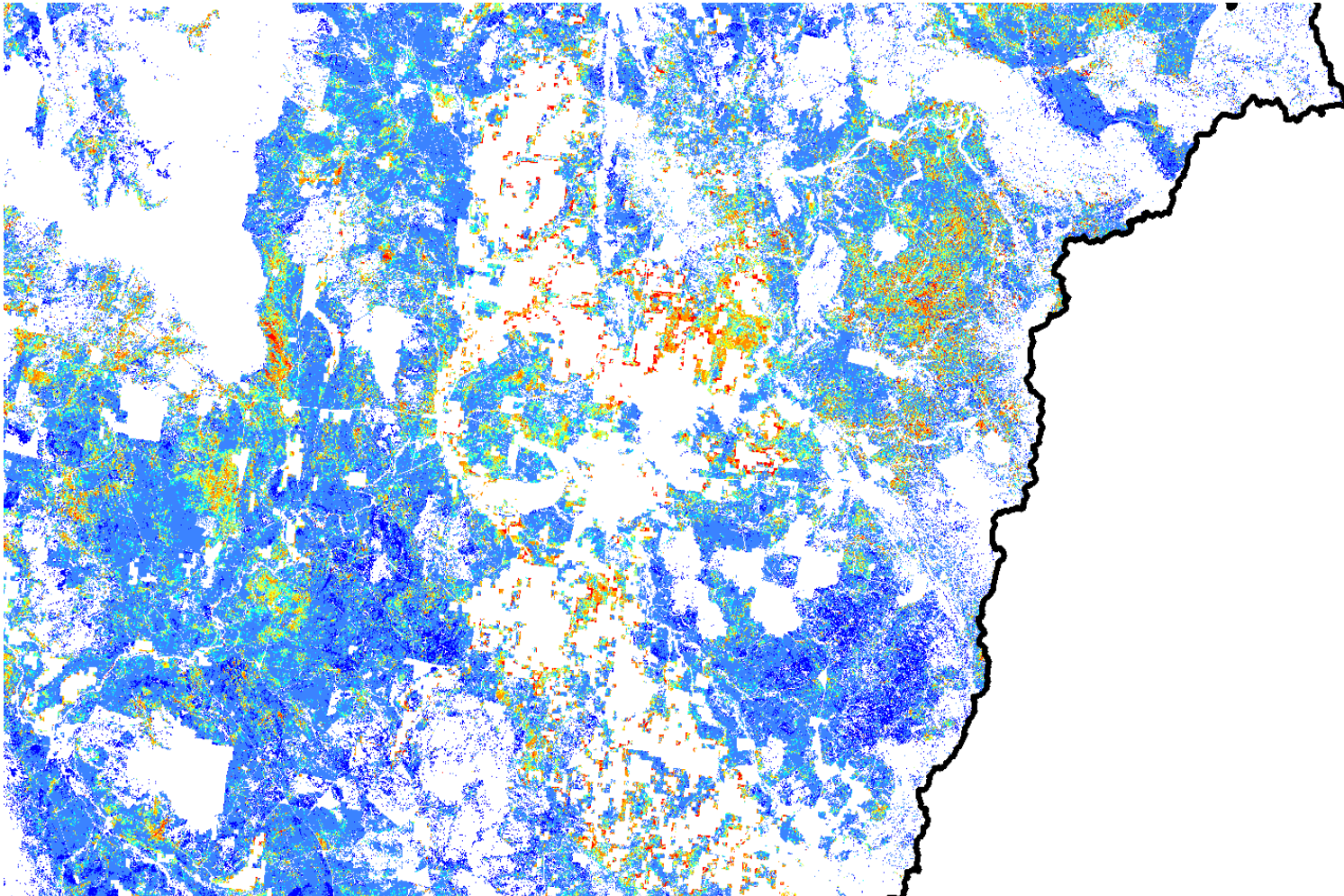
GRASP problem 3 – peaks in NPV suggest arbitrary decision rules switching on



GRASP problem 4 – confidence intervals are very broad



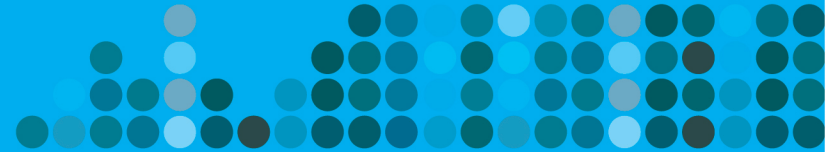
GRASP Problem 5 – difficult to relate results to bare ground mapping





Implications

- Case study
 - Are the predictions from bioeconomic models accurate?
 - Allows land types to be ranked and selected for targeted investment
- Wider extrapolation
- Methodological
 - Difficult to ensure bioeconomic models are robust even with well established biophysical models



Conclusions

- Does the economic model, and economic theories provide any insights into how the model can be improved
 - Marginal increase in returns at a diminishing rate?
 - Ability to implement all the sub-models such as pasture sub-model, animal production sub-model and land type models