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Submission to Reef Regulations Consultation Regulatory Impact

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Reef Regulation RIS Submission
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AgForce is the peak rural group representing the majority of beef, sheep & wool and grain producers in Queensland. The broadacre beef, sheep and grains industries in Queensland generated around $6.8 billion in gross farm-gate value of production in 2015-16. AgForce exists to facilitate the long-term growth, viability, competitiveness and profitability of these industries. Our members provide high-quality food and fibre products to Australian and overseas consumers, manage around 40 per cent of the Queensland agricultural landscape and contribute significantly to the social fabric of rural and remote communities.

AgForce is the member-based, peak representative group representing the majority of beef, sheep and wool, and grain producers in Queensland. AgForce exists to ensure the long-term growth, viability, competitiveness and profitability of these industries that provide high quality food and fibre products to Australian and overseas consumers, manage more than 50 per cent of Queensland's natural resources and contribute to the social fabric of rural and remote communities.

Beef cattle grazing is the major land use area in the Great Barrier Reef catchment with over 33.7 million hectares grazed across the six catchments draining into the Great Barrier Reef Lagoon. According to the Australian Bureau of Statistics 2010 survey , 12,550 grazing enterprises manage this grazing land use area across the reef regions.

Broadacre dryland cropping areas vary from year to year depending on seasonal growing conditions. Each year, there is approximately 345,000 hectares sown to cereal and oilseeds by approximately 1,080 grain-growing enterprises across the reef regions.

Due to the agriculture being the largest land use area in the six Reef catchments, Reef science has turned to primary producers as the main area of influence to improve Reef water quality. Adoption of best land management practices can provide co-existence between agricultural and environmental sustainability.

Voluntary Grazing BMP benchmarking shows 75% of 1682 graziers manage frontage and riparian country at or above best practice, 10% below best practice and 15% do not have riparian frontage. Further regulation is not necessary.

For the reasons set out below AgForce does not support the selection of Option 2 in the RIS:

1. The RIS is flawed in its analysis of Option 1 by:

   (a) failing to take into account current scientific views that place greater emphasis on major risks to Reef health such as climate change, weather, sediment resuspension and ocean temperatures. The RIS fails to state how the proposed new regulation will support or address these major risks;
   (b) Failing to consider an alternative option being a combination of Option 1 together with measures that will address the scientifically based concerns about the major risks of climate change, weather, sediment re-suspension and ocean temperatures as potentially having less financial impact on agricultural producers than the savage financial impacts of Option 2;
   (c) Failing to consider the option of continuing the current approach but enhancing same through better implementation of existing mechanisms such as the use of web-based, land condition and ground cover monitoring tools such as FORAGE[1] and erodible soil erosion hazard maps[2] to target areas of persistent and vulnerable low grazing land condition on erodible soils at a much lesser cost that the cost of the proposed regulations.
   (d) Failure to investigate and/or measure within the RIS the extent to which the high risks identified above affect water quality on the Reef leads to a flawed analysis of the degree to which past BMP initiatives have or have not been successful and fatally undermines the conclusion (said to be the basis for the RIS supporting Option 2) that *"the current rate of uptake will not be enough to make sufficient progress towards the water quality targets".* In the absence of study as to the impact of the high risks referred to above on water quality targets, no proper measurement of the rate of progress against such targets can be made.
   (e) Fails to appropriately acknowledge and is blatantly dismissive of the significant compliance gains made through industry BMP uptake.

2. The RIS is flawed in its recommendation of Option 2 because:

   (a) Proposed Option 2 regulations do not address the major risks to Reef health such as climate change, weather, sediment resuspension and ocean temperatures.
   (b) There are sufficient, web-based, land condition and ground cover monitoring tools such as FORAGE[3] and erodible soil erosion hazard maps[4] to target areas of persistent and vulnerable low grazing land condition on erodible soils;
   (c) The new minimum standards for agricultural ERA's do not focus on subsoil erosion from gullies, banks and deep rills[5]. Government (voluntary and regulatory measures) and Reef Trust funds should only focus on these high risk, erodible hotspots;
   (d) The impact assessment that does not explain the logic of how a potential annual cost of $86M to $1.3 billion to producers is of more benefit to the community than alleged benefits of $54M per year for 10 years.

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[1] Long Paddock FORAGE https://www.longpaddock.qld.gov.au/forage/
[2] Long Paddock Erodible Soils Report for Burdekin and Fitzroy catchments https://www.longpaddock.qld.gov.au/forage/erodiblesoils.php
[3] Long Paddock FORAGE https://www.longpaddock.qld.gov.au/forage/
[4] Long Paddock Erodible Soils Report for Burdekin and Fitzroy catchments https://www.longpaddock.qld.gov.au/forage/erodiblesoils.php
[5] 2017 Reef Scientific Consensus Statement. Chapter 5. Page 9. Sediment sources http://www.reefplan.qld.gov.au/about/assets/2017-scientific-consensus-statement-summary-chap05.pdf

(e) Fails to undertake a costs/benefits analysis of actions to remedy the current scientifically identified high risks mentioned above with the costs/benefits of the proposed regulatory enhancement to ascertain which is more cost effective and less financial impact on producers

(Option 1) No additional Reef Protection regulations are required.

There is insufficient evidence that existing Reef regulations imposed by the *Environmental Protection Act 1994* and *Chemical Usage (Agricultural and Veterinary) Control Act 1988* have had any effect on water quality targets within the Reef 2050 Plan and therefore an assessment that they have been slow acheiving the rate toward targets is not supported by any scientific analysis. Furthermore, in the absence of quantifying the effect of the high risks referred to above and measuring their impact versus trends in compliance with existing Reef regulations, there is no basis for any conclusions to be made about whether the rate of progress toward water quality targets will be achieved through broadening and enhancement of regulation.

No previous data from Reef Protection regulations (2010 to 2018) have been used for Paddock to Reef modelling, Reef Report Cards or measuring practice change.

There are sufficient existing legislative instruments such as the *Land Act 1994*, *Vegetation Management Act 1999* and *Soil Conservation Act 1986* which protect land and soil condition and prevent environmental degradation across reef catchments and entire Queensland.

There are sufficient, web-based, land condition and ground cover monitoring tools such as FORAGE[6] and erodible soil erosion hazard maps[7] to target areas of persistent and vulnerable low grazing land condition on erodible soils.

High-risk erodible soils include sodic soils, duplex soils and other dispersive soils. Sediment tracing in catchments such as the Burdekin confirmed all coarse sediment particles (>16microns) and eighty per cent of particulate nutrients are deposited within 10km of the river mouth[8]. Only a portion of the fine suspended sediment (<16 microns) forms turbid flocs which may impact on the inner shore Reefs within 60km of the coastline[3]. Even the Reef Protection Regulation RIS (page 94) and 2017 Scientific Consensus Statement state that 90 per cent of fine sediment runoff is from subsoil erosion from gullies, banks and deep rills[9]. Government (voluntary and regulatory measures) and Reef Trust funds should only focus on these high risk, erodible hotspots.

Where possible, implement practical, cost-effective practices and interventions to improve land condition and reduce erosion risk on the few hotspots. This targeted approach is better use of government funding. There is no need to impose unnecessary Option 2 regulations on the majority of producers implementing best practice and effectively caring for their land, animals and crops.

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[6] Long Paddock FORAGE https://www.longpaddock.qld.gov.au/forage/
[7] Long Paddock Erodible Soils Report for Burdekin and Fitzroy catchments https://www.longpaddock.qld.gov.au/forage/erodiblesoils.php
[8] Lewis S, Bartley R, Bainbridge Z, Wilkinson S, Burton J, Bui E. 2015. Burdekin sediment story. Report no 15/50 for NQ Dry Tropics NRM. https://research.jcu.edu.au/tropwater/publications/1550BurdekinSedimentStory.pdf
[9] 2017 Reef Scientific Consensus Statement. Chapter 5. Page 9. Sediment sources http://www.reefplan.qld.gov.au/about/assets/2017-scientific-consensus-statement-summary-chap05.pdf

Reef staff and Queensland Government generally need to gain a better understanding of the 26 pieces of existing legislation and regulations for environmental management and planning used across agricultural land in Queensland, before recommending additional policy changes.

Delay the rollout of Queensland Government Reef Protection Compliance Orders until at least 12 months after the initiation of Reef Trust III funded projects, which propose to engage below industry standard producers through a one-on-one industry mentoring program.

Option 2 to enhance and broaden Reef Protection legislation

Option 2 is not supported. The regulatory cost to grazing and cane enterprises across Reef catchments proposed in option 2 will impose economic losses to many agricultural enterprises, especially smaller holdings.

AgForce does not support expanding Reef regulations into all six Reef catchments, nor making grain production an Environmental Relevant Activity ERA (RIS, page 9)

Information and assumptions need to be transparent and support a system for producers impacted by regulatory compliance orders to access plans and information. NRM and external extension services are essential to producers with compliance orders.

Too many layers have become dependent on Reef funding and not effectively connected to where change management may need to occur within sustainable and productive land use systems.

Ground cover targets have been exceeded and erosion risk minimised from grazing land, ever since Reef Report Cards were created in 2009. Since 2009, Reef scientists have shifted their focus from hillslope erosion risks to the hotspots of gully erosion. Why is there a lag for government regulators to utilise this new Reef science?

Agriculture is an essential pillar for economic growth of Queensland and should be acknowledged for environmental stewardship, not bludgeoned with more red tape and regulation. The proposed minimum standards for grazing (as per Table 59 in the RIS) only create more record-keeping for graziers to enable government compliance officers to conduct a desktop check of paper work. There is no evidence presented on how the proposed regulatory standards of property maps and records can further reduce suspended sediment and nutrient runoff from erodible hotspots on a property to improve Reef water quality. The proposed minimum standards and farm design standards for greenfield and intensifying grazing activities appear to repackage the previous Environmental Risk Management Plans ERMP's into a new format and do not result in on-ground actions.

Further comments on specific components of the RIS and Appendices are provided across the following pages.

Background:

The Great Barrier Reef World Heritage Area is a diverse, complex tropical ecosystem which is influenced by a range of biotic and abiotic factors including localised water quality, ocean currents, geomorphology and international weather and temperature variations. In addition to direct uses

such as tourism and fishing, the Reef is an iconic environmental area for national and international scientists, all contributing to understanding tropical ecosystem function.

The Reef 2050 Long Term Sustainability Plan (2015) identified Outstanding Universal Values and attributes of the Reef and outlined multiple actions to protect this internationally renowned asset.

The biggest threat to the Reef is climate change, which is a global issue[10, 11]. Resuspension of existing sediment on the ocean bed caused by weather and currents is the main cause of turbidity over the inner, middle and outer Great Barrier Reef. Severe tropical cyclones cause structural damage to hard corals and decimate sea grass beds[12]. Ocean currents can trigger rises in ocean basin sea surface temperatures which results in extensive coral bleaching events[13]. These major threats to the Reef are beyond human intervention and cannot be changed. No regulation of agricultural producers will fix these major global impacts.

Community social values has pressured the Australian and Queensland Governments to expend an additional $300million of taxpayers' money over five years, predominantly on activities to improve, monitor and model quantity and quality of land-based runoff from adjacent catchments to the Reef. In addition to the existing 26 pieces of legislation regulating activities in coastal and Reef catchment areas, the Queensland Department of Environment and Heritage Protection intends to extend and broaden Reef Protection regulations. The Regulatory Impact Assessment RIS estimates implementing Option 2 regulations will cost state government $16million whereas graziers and canegrowers will wear the brunt of Reef regulatory costs between $603million to $9.2billion over ten years (Table 1).

Before considering additional Reef Protection regulation, the ReefPlan targets need to be reviewed and relevant targets set.

Any proposed regulatory approach needs to align with recent reef science which indicates the main source of fine suspended sediment is subsurface soil erosion features (gullies, scalds, rills and streambank erosion).

Timely decision tools for drought preparedness are required rather than regulated codes of practice. Annual Reef report cards from 2010 to 2014 confirm grazing lands have always exceeded the ReefPlan target for 70 per cent end of dry season ground cover.

AgForce welcomes some recommendations, such as increasing the amount of in catchment monitoring, sediment trap monitoring and improve understanding of land management practice change. These would improve modelled predictions for Reef Report Cards.

Industry agrees the ABCD reef reporting frameworks for management practice are cumbersome and unrealistic of actual grazing practices. Adoption levels of voluntary Grazing BMP have increased exponentially. Between 2010 to 2017, over 1800 Queensland graziers managing 26 million hectares have benchmarked their businesses across the five BMP modules (Figure 1). An additional 700

[10] Reef 2050 Plan http://www.environment.gov.au/marine/gbr/publications/reef-2050-long-term-sustainability-plan .
[11] Langlais CE, Lenton A, Heron S. 2017. How to work out which coral reefs will bleach and which might be spared. The Conversation https://theconversation.com/how-to-work-out-which-coral-reefs-will-bleach-and-which-might-be-spared-84842
[12] Great Barrier Marine Park Authority. Current condition of the Reef. May 2017. http://www.gbrmpa.gov.au/visit-the-reef/current-conditions-on-the-great-barrier-reef
[13] Great Barrier Marine Park Authority. Reef Health 2017. http://www.gbrmpa.gov.au/about-the-reef/reef-health

graziers are working through the five BMP modules. The industry standards within voluntary Grazing BMP provide a holistic approach to grazing management and opportunity for voluntary continuous improvement. There is increasing market drivers for graziers to adopt voluntary Grazing BMP, therefore reducing the need and compliance cost for Reef Protection regulations.

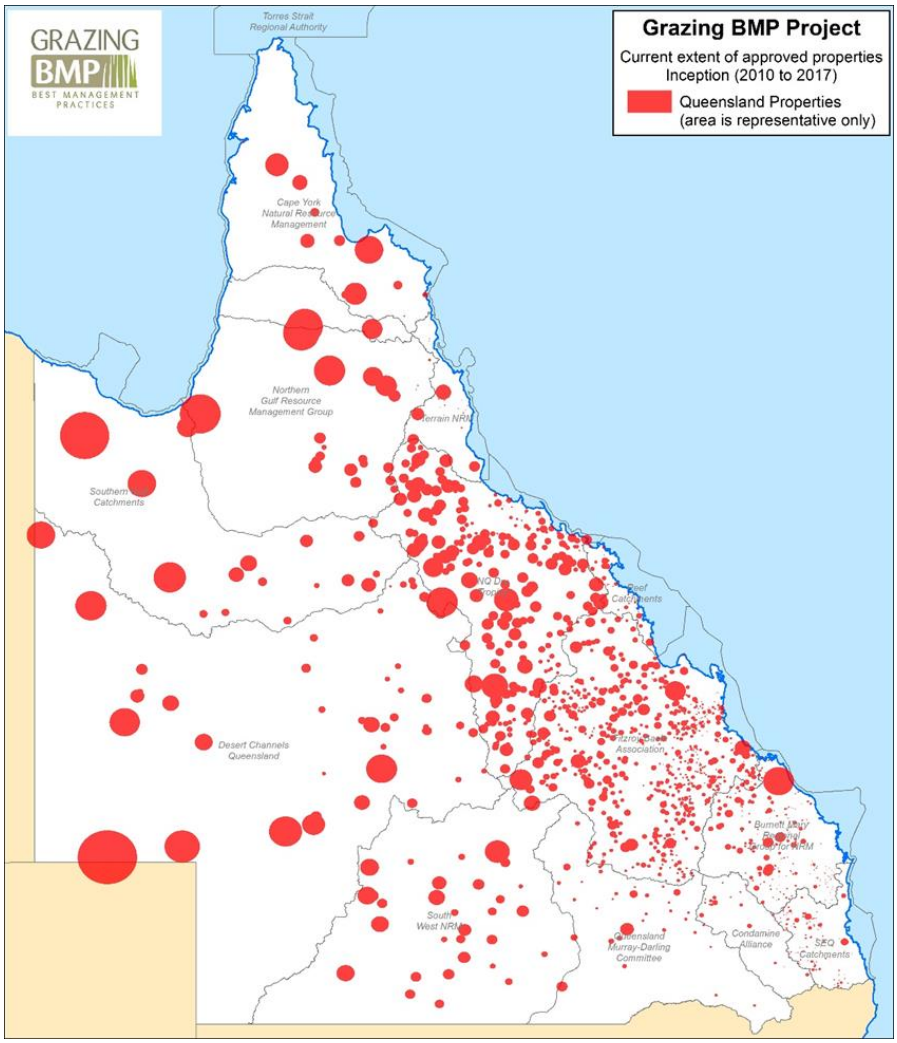


Figure 1. Grazing BMP coverage for Queensland (2010-2017). Source: S. Lacey, AgForce 2017.

Table 1: Present value of costs to implement Option 2 Reef Regulations extending over six catchments. Source: Consultation RIS, page 70 and 76.

Cost of Reef Regulations	**Present value of costs - Total**	**Annual cost / year over 10 years**
Government	$16M	$1.3M
Grazing and cane industries - best to worst case	$603M to $9.2billion	$86M to $1.3billion
TOTAL COSTS	**$853M**	**$130M**

Imposing mandatory Reef "B" level practices on graziers will result in farm profit losses, especially across the smaller grazing enterprises in the Burnett Mary, Wet Tropics and Mackay Whitsunday catchments (refer to Table 47 in RIS). Mandatory Reef "B" low risk practices[14] such as regular wet season spelling[15], subdivisional and riparian fencing are often not feasible on small pastoral areas. A four-year, replicated industry research trial across nine northern Australia properties showed seasonal conditions and stocking rate management influenced soil surface and pasture condition, not grazing systems (continuous, rotational or cell grazing)[16].

Page 52 of the Reef Protection RIS also outlines ABCD grazing practices may not necessarily align to ABCD land condition. The relationship between management practices and ground cover is complicated. The proposed mandatory farm design and minimum practice standards for new greenfield grazing sites are too prescriptive and not feasible for many situations (Table 63 in RIS).

Appendix 3: Consideration of other legislative frameworks (page 84)

The Reef Protection RIS has not considered how regulations could be addressed by existing environmental legislation and regulations affecting Queensland producers. Most of the desired Reef Protection outcomes for good land condition, soil conservation, managing waterways and minimising runoff of sediment and nutrient from agricultural land are achieved through existing legislation such as: -

Land Act 1994	Leaseholders must maintain land in good condition through good land management practices and preventing land degradation and contamination
Vegetation Management Act 1999	Regulation of vegetation clearing to ensure no land degradation and maintain ecological processes.

[14] ReefPlan Paddock to Reef Grazing Water Quality Risk Framework http://www.reefplan.qld.gov.au/measuring-success/paddock-to-reef/assets/paddock-to-reef-grazing-water-quality-risk-framework.pdf

[15] Alluvium 2016. Costs of achieving the water quality targets for the GBR. Department of Environment and Heritage Protection. (page 88 and 89). http://www.ehp.qld.gov.au/assets/documents/reef/costings-report.pdf

[16] Hall T, McIvor J, Jones P, MacLeod N, McDonald C, Reid D, Smith D, Delaney K. 2011. Investigating cell grazing and other grazing management systems in northern Australia. Meat and Livestock Australia https://www.mla.com.au/research-and-development/search-rd-reports/final-report-details/Environment-On-Farm/Investigating-cell-grazing-and-other-grazing-management-systems-in-northern-Australia/360

Soil Conservation Act 1986	Prepare and approve soil conservation plans, run-off control structures to mitigate soil erosion
Environmental Protection Act 1994	Everyone has a general environmental duty. Regulates intensive agriculture (e.g. feedlots, poultry farms) and high impact earthworks in wetland protection areas.
Planning Act 2016	Planning approval for new intensive agriculture and farm diversification to ensure ecological sustainability.
Water Act 2000	Responsible management of works within watercourses, lakes, springs or activities that interfere with overland flow or impact on underground water.

Other options for landscape condition and monitoring

The Reef Protection RIS has not considered emerging technologies for monitoring land condition which enable sustainable production and environmental outcomes without the cost of regulation and compliance.

AgForce recommendations are: -

- Enhance productivity by improving property level land condition with remote monitoring technologies
- Need to develop a systematic way of storing & sharing information
- Integrate NRM economics and demonstrate links to profitability
- Convey the implications of climate change on profitability, carrying capacity and ground cover
- Address the extension effort deficiency and look at additional, effective models of delivery of technology and information.

Queensland has a competitive advantage in new remote sensing and GIS land monitoring technologies at statewide and catchment scales, as well as for undertaking property-level assessments. However, to achieve a tangible benefit for the beef industry (i.e. use information to facilitate production efficiency) an understanding of management at the local scale is required.

The use of remote sensing with traditional land monitoring tools is a new way for engaging with producers for gauging the success of local grazing practices and developing future options for enhancing productivity by improving land condition.

This work has relevance for demonstrating sustainable agriculture and moving towards positive economic, social and environmental outcomes for NRM regions. While DATSIP, DSITI, DNRM and DAF are capable of collecting monitoring data in its own right, there are other activities conducted by agencies that, if tailored slightly, could add value to the on-ground information database, and improve satellite-based monitoring outputs

Land condition monitoring projects should target and encourage closer scientific collaborations between biophysical scientists, landholders and economists.

Appendix 1: Impact assessment (page 48)

The Reef Protection RIS (pages 48 and 49) underestimates the number of grazing properties (8,543) across the six Reef catchments, when compared with data from the Australian Bureau of Statistics ABS. ABS recorded 12,878 grazing properties (Table 2). This 33 per cent difference has a large bearing on regulatory costs, both to industry and government. RIS compliance costs need to be based on the actual number of affected producers. The Department needs to accurately quantify affected agricultural enterprises across six Reef catchments before considering extending Reef regulations and the associated RIS costs.

Table 2: Grazing enterprises in Great Barrier Reef Catchment

Size of enterprise	<200ha	200 to 2000ha	>2000ha	TOTAL
No of grazing enterprises	6 641	3 921	2 316	12 878

Source:Land Management Practices in the Great Barrier Reef Catchments, Experimental Estimates, 2008–09 (4619.0.55.002).

It is not evident from the RIS if the new Reef Protection regulations will only apply to beef cattle grazing enterprises greater than 2000 hectares (as per *Environmental Protection Act 1994*) or all 'commercial' grazing enterprises (beef and sheep), regardless of size. The RIS needs to clarify the definition used for 'commercial' enterprises.

Appendix 4: Minimum regulatory standards for grazing properties
(RIS, Table 59 on page 85)

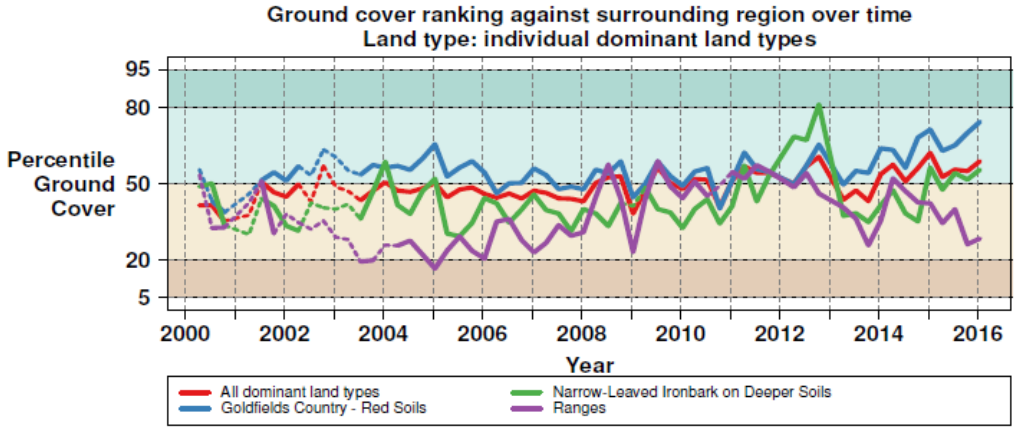
Stocking rates for entire enterprise rather than each paddock
Stocking rates are transient and variable per paddock. It is not clear how this data will be assessed by compliance officers and or the criteria for a "suitable" method. Paddock stocking rates depend on pasture utilisation rates, pasture species, land condition, rainfall and feed intake[17]. There are several methods used to determine stocking rates which all should be considered "suitable methods". Will compliance officers be skilled in livestock production?

Carrying capacity or stocking rate for the entire grazing enterprise is the preferred metric for Reef record-keeping. Short-term carrying capacity is the number of animals that a grazing area can support over a season or year.

Long Paddock FORAGE in preference to photo monitoring sites
Reef Protection regulations need to advance with new technologies adopted by graziers. Long Paddock FORAGE reports provide an excellent ground cover and land condition monitoring report which can compare grazing land types across a property with the regional 95% percentiles for land condition over a 15-year period (Figure 2). FORAGE [18], Veg Machine[19] and fee-for-service NRM Spatial Hub[20], now Farm 4D are all superior to photo monitoring for land condition.

[17] Sneath R. Future Beef. Dry season pasture budget: a guide for stocking rates https://futurebeef.com.au/knowledge-centre/dry-season-pasture-budget-a-guide-for-stocking-rates/
[18] FORAGE https://www.longpaddock.qld.gov.au/forage/groundcover.php
[19] Veg Machine https://vegmachine.net/
[20] NRM Spatial Hub http://www.nrmhub.com.au/mapping-2/

Figure 2: Long Paddock FORAGE provides free, web-based, ground cover monitoring, land condition and erodible soils reports for a designated property over a 15-year period. FORAGE is a superior tool to photo monitoring sites.



Defining land condition

It is unfortunate that the Reef Protection regulation has used a different definition to land condition than the widely-accepted grazing industry definition for land condition[21]. This causes confusion when monitoring land condition attributes.

LAND CONDITION - definition	
Reef Protection – Minimum Standards (Table 59 in RIS)	**Future Beef**
Proportion of ground cover and density of perennial pasture species.	Capacity of grazing land to produce useful forage. Three monitored components include soil, pasture and woodland condition.

Reef regulation is only concerned about ground cover, erosion and runoff. Graziers and industry service providers monitor soil organic matter, soil structure, erosion levels, density of perennial, productive and palatable 3P grasses, ground cover > 50 per cent, weeds, native and weedy woody plant density.

Fertiliser use and fertiliser resellers

The RIS does not specify if fertiliser use on forage and fodder crops is exempt from record-keeping and management plans, as per previous Reef Protection regulations (Section 95(2) of the *Environment Protection Act 1994*). It is not apparent if urea (nitrogen) and phosphorus fertilisers used for livestock supplement feeding will be exempt from record-keeping by fertiliser resellers and graziers.

Agricultural chemical record-keeping

[21] Schulke B. Future Beef. Land condition – definition and indicators https://futurebeef.com.au/knowledge-centre/land-condition/

Pesticide runoff monitoring has continued to demonstrate levels of Photosystem II herbicides (prescribed ERA agricultural products) detected in marine waters are very low, always below 99 per cent and 95 per cent ecotoxicity threshold concentrations. The only area of risk exposure is after sudden storms in a few adjoining freshwater and estuarine communities[22]. There is no evidence of agricultural chemicals impacting on Reef health at the detected, low concentration levels. The only outcome has been fuelling general community hysteria about the safety and use of pesticides in our environment. Governments should focus research efforts and expenditure on other marine pollutants such as nanoparticles and plastics[23] and their emerging impact on marine ecosystems.

The national Livestock Production Assurance LPA[24]. system requires livestock, crop, pasture and paddock treatment records for all agriculture and veterinary chemical applications[25]. Required paddock records should be the same list so graziers record this information only once. Red tape burden has resulted in different components required for Reef Protection regulation compared to national LPA record keeping (Table 3).

[22] Devlin M, Lewis S (eds). 2015. Advancing our understanding of the source, management, transport and impacts of pesticides on the Great Barrier Reef. TropWater, James Cook University http://www.ehp.qld.gov.au/assets/documents/agriculture/sustainable-farming/reef/rp104c-pesticide-report.pdf

[23] 2017 Reef Scientific Consensus Statement. Chapter 3. Page 12. Plastic as an emerging pollutant http://www.reefplan.qld.gov.au/about/assets/2017-scientific-consensus-statement-summary-chap03.pdf

[24] Meat and Livestock Australia. 2017. Record keeping for Livestock Production Assurance https://www.mla.com.au/meat-safety-and-traceability/red-meat-integrity-system/about-the-livestock-production-assurance-program/record-keeping/

[25] Livestock Production Assurance. Fodder crop, grain and pasture treatments and stock foods https://www.mla.com.au/globalassets/mla-corporate/meat-safety-and-traceability/documents/livestock-production-assurance/factsheets/22422-lpa-fact-sheet-3_safe-livestock-feed_web.pdf

Table 3. Differences in agricultural chemical record-keeping components between the national Livestock Production Assurance system and Reef Protection regulations.

LPA – Paddock and stock feed records of agricultural treatments[26]	**Reef Protection Regulation records for applying prescribed ERA agricultural chemicals**[27]
Similar records across both requirements	
✓ Treatment date. ✓ Location/size. ✓ Quantity of treatment. ✓ Chemical used. ✓ Application rate.	
Differing records	
➢ Batch no and expiry date. ➢ Grazing withholding period ➢ Slaughter / export withholding period	➢ Spray conditions (time, meteorological conditions). ➢ Operator (name, contact, qual's). ➢ Map of treated area. ➢ Product trade name. ➢ Equipment and method used. ➢ Retain record for six years.

[26] Livestock Production Assurance. Fodder crop, grain and pasture treatments and stock foods https://www.mla.com.au/globalassets/mla-corporate/meat-safety-and-traceability/documents/livestock-production-assurance/factsheets/22422-lpa-fact-sheet-3_safe-livestock-feed_web.pdf

[27] Chemical Usage (Agricultural and Veterinary) Control Regulation 2017. Section 32. Required record for prescribed ERA products https://www.legislation.qld.gov.au/view/html/inforce/current/sl-2017-0136#sec.32

Soil erosion principles to be considered by Reef Protection RIS

1. **Native vegetation management in the Great Barrier Reef (GBR) catchments**

- Protecting bare erodible soils and preventing further gully erosion is the priority for Reef health, not native tree cover.
- The soil erodibility factor used in Reef modelling is based on runoff studies from pasture areas. No Reef science studies have measured and modelled suspended sediment runoff from wooded vegetation areas.
- Voluntary Grazing BMP benchmarking shows 75% of 1682 graziers manage frontage and riparian country at or above best practice, 10% below best practice and 15% do not have riparian frontage. Further regulation is not necessary.

2. **Ground cover determines erosion risk, not tree cover**

This major soil conservation principle[28] is outlined in the 2015 *Soil Conservation Guidelines for Queensland*[29]. Streambank stabilisation is achieved through a combination of both woody vegetation and grass ground cover[30].

Numerous runoff studies have repeatedly demonstrated that level of ground cover determines runoff and erosion risk. Table 4 provides examples of soil erosion studies conducted in Reef catchments.

Table 4: A selection of scientific studies conducted in Reef catchments which demonstrate ground cover, not tree cover, determines runoff and erosion risk.

Reef Catchment	Location	Details	Reference
All Reef catchments	Remote sensing	GIS land condition study. End of dry season ground cover > 70 % reduces erosion risk.	Beutel *et al* 2014[31]

[28] Scanlan JS and Turner EJ, 1995. *The production, economic and environmental impacts of tree clearing in Queensland*. Report to the Working Group of the Ministerial Consultative Committee on Tree Clearing.

[29] Queensland Government, 2015. *Soil Conservation Guidelines for Queensland*. Available online at http://www.qld.gov.au/environment/land/soil/erosion/guidelines/

[30] Simon A and Collison AJC. 2002. Quantifying the mechanical and hydrologic effects of riparian vegetation on streambank stability. *Earth Surface Processes and Landforms*. 27(5). pp527-546.

[31] Beutel TS, Tindall D, Denham R, Trevithick R, Scarth P, Abbott B and Holloway C. 2014. *Getting ground cover right: thresholds and baselines for a healthier reef*. Report RRRD027 to the Reef Rescue Research and Development Program. Available online at http://www.reefrescueresearch.com.au/research/all-projects/23-final-reports/165-rrrd027-final-report-2.html

Reef Catchment	Location	Details	Reference
Fitzroy and Burdekin	Bioeconomic modelling	Tree density affects economic viability of land rehabilitation. Compared sediment exports from four grazing land types, four land conditions, cleared versus wooded vegetation.	Star and Donaghy, 2010[32]
Burdekin	Upper Burdekin	Runoff was 50 to 70 % less from cleared country with sown pastures compared to timbered Eucalypt woodland.	McIvor *et al*, 1995[33]
Fitzroy	Nogoa Basin	Study of runoff over seven years from 12 hillslopes and cover ranging from 10 to 80 %. Runoff was 33 mm/yr with ground cover above 50 %.	Silburn *et al*, 2011[34]
Burnett	Tarong	Runoff measured from five levels of ground cover on a 15 degrees slope. Erosion rates minimal (0.5 t/ha) when ground cover was 47 % or greater	Loch, 2000[35]
Fitzroy	Rubyvale & Injune	Runoff increased with rainfall amount and intensity and decreased with increasing ground cover –150 to 11,000kg/ha/yr depending on ground cover.	Silcock *et al*, 2005[36]

The report by Megan Star & Peter Donaghy (QDAF, 2010) on bioeconomic modelling of Burdekin & Fitzroy grazing systems clearly outlines how tree basal area TBA can increase sediment runoff for the same level of pasture utilisation (compared to cleared country) across a range of grazing land types. Tonnes of sediment exported are always greater in tree – studded landscapes compared to cleared landscapes (TBA = 0). Grazing land types were:-

- Goldfield red soils (TBA 0 and 3.5 m^2/ha)
- Silver leaf ironbark (TBA 0 and 7.5m^2/ha)
- Silver leaf ironbark on duplex (TBA 0 and 5m^2/ha)
- Spotted gum ridges (TBA 0 and 11m^2 /ha)

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[33] McIvor JG, Williams J and Gardener CJ. 1995. Pasture management influences runoff and soil movement in the semi-arid tropics. *Australian Journal of Experimental Agriculture*. 35, pp55-65.
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[35] Loch RJ. 2000. Effects of vegetation cover on runoff and erosion under simulated rain and overland flow on a rehabilitated site on the Meandu Mine, Tarong, Queensland. *Australian Journal of Soil Research.* 38, pp 299-312.
[36] Silcock RJ, Jones P, Hall TJ and Water DK. 2005. *Enhancing pasture stability and profitability for producers in Poplar Box and Silver Leaved Ironbark woodlands*. Report to Meat and Livestock Australia. No NAP3.208.

In June 2015 the Queensland Audit Office report on '*Managing water quality in GBR catchments*' stated a 229% increase in land clearing in reef catchments from 2008/09 [31,000ha] to 2013/14 [102,000ha]. No Government information is available to demonstrate if these clearing rates increased the risk of sediment runoff to the Reef.

3. Protecting bare erodible soils and preventing further gully erosion is the priority for Reef health. "Strengthening regulations to protect" riparian areas covered with woody vegetation and high ground cover would not reduce the main erosion source of bare subsoils.

Bartley at al (2016)[37] did not find any significant difference in streambank stability and erosion risk between woody riparian buffers (>75% cover) and limited woody vegetation cover (< 50%). The main cause of channel widening and erosion was upstream land condition and flood events.

Sediment tracing studies have concluded the main source of fine silt and clay suspended sediment in the Burdekin catchment is from bare subsoils[38] with more than 40 per cent from gully erosion[39]. Subsoil erosion is a factor of soil erodibility, slope, current and historical land uses

Before Queensland Government rules to extend Category R regulations into an additional three Reef catchments for riparian and wetland landscapes in good condition, consider the new Reef science on sediment fallout in river deltas and the composition and movement of suspended sediment plumes along the Reef coastline.

For example, over 90 per cent of sediment from the Burdekin River falls out of suspension when mixed with sea water within 50km of the river's mouth[40]. According to the Reef scientists at TropWater James Cook University, these new sediments do not contribute to the flood plumes seen in Bowling Green Bay and Cleveland Bay. Plumes within the Bays arise from sediment re-suspension events (from windy conditions stirring up historical river flow events) and organic-rich very fine suspended sediments[41]. Processing of Burdekin flood plume samples as a result of Tropical Cyclone Debbie has provided important insights on nutrient processing within river flood plumes. Ammonium ions are released from suspended sediment and there is a large portion of bioavailable particulate organic nitrogen. (*Stephen Lewis, TropWater, pers.comm*.). Reef Regulations need to consider this emerging Reef science before imposing regulations on fertiliser use and recording. Organic nitrogen is not sourced from fertiliser (inorganic nitrogen).

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[37] Bartley R, Philip S, Henderson AE and Tindall D. 2016. Investing in riparian zone management to reduce erosion from stream channels: how do we evaluate success? Report to the National Environmental Science Programme. Reef and Rainforest Research Centre Ltd, Cairns. 54pp. http://nesptropical.edu.au/wp-content/uploads/2016/04/NESP-TWQ-1.2-PART-A-FINAL-REPORT.pdf.

[38] Wilkinson SN, Olley JM, Furuichi T, Burton J, Kinsey-Henderson AE. 2015. Sediment source tracing with stratified sampling and weightings based on spatial gradients in soil erosion. J Soils Sediments. DOI 10.1007/s11368-015-1134-2.

[39] Wilkinson SN, Bartley R, Hairsine PB, Bui EN, Gregory L, Henderson AE. 2015. Managing gully erosion as an efficient approach to improving water quality in the Great Barrier Reef lagoon. Report to the Department of the Environment. CSIRO Land and Water, Australia.

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[41] Bainbridge ZT, Wolanski E, Alvarez-Romano JG, Lewis SE, Brodie J. 2012. Fine sediment and nutrient dynamics related to particle size and floc formation in a Burdekin River flood plume, Australia. Marine Pollution Bulletin. 65. 236-248.

4. How much clearing was Category R between 2009 to 2013?

The 2014 Reef Report Card[42] showed only a 0.4% loss (30,980ha) in riparian woody vegetation extent, between 2009 to 2013. Riparian woody vegetation extent within 100 metres of Reef watercourses is only measured every four years. Woody vegetation riparian extent is measured across all land uses (agricultural, industrial and urban development) and includes substantial loss of riparian woody vegetation associated with Category 4/5 cyclones crossing the Reef since 2009 (eg. Cyclones Hamish, Ului, Yasi and Marcia). Not all this loss of riparian woody vegetation can be attributed to agricultural land use. Even so, the loss of 30,980ha over four years is only 14 per cent of the total cleared area of 226,000ha across six Reef regions between 2010 and 2013

5. Controlling woody weeds in Reef riparian areas

Producers are required to selectively control Restricted Matter declared tropical, invasive woody weeds such as rubber vine, bellyache bush, Parkinsonia, chinee apple and lantana, which all frequently infest riparian zones in Reef catchments. The General Biosecurity Obligation to control and prevent spread of declared weeds is a legislated landholder requirement under the *Biosecurity Act 2014*.

The Queensland Government SLATS 'woody vegetation clearing rates' do not distinguish between clearing native woody vegetation versus introduced woody weeds. Woody vegetation in SLATS Reports[43] is defined as assemblages of all woody plants (native vegetation, regrowth, plantations and woody weeds) with a tree crown cover of 20 per cent which equates to 11 per cent Foliage Projective Cover. The 2013/14 annual clearing rates within the six Reef catchments only impacted on 0.2 per cent (108,000ha) of the total Reef catchment area (52M hectares). In 2013/14, 54 per cent of vegetation clearing (58,600ha) across Reef regions was in the Fitzroy catchment, which was predominantly non-remnant and non-regulated (Category X) brigalow regrowth.

[42] Reef Water Quality Protection Report Card 2014 http://www.reefplan.qld.gov.au/measuring-success/report-cards/2014/

[43] Queensland Department of Science, Information Technology and Innovation. 2015. Land cover change in Queensland 2012-13 and 2013-14: a Statewide Landcover and Trees Study (SLATS) report. DSITI, Brisbane.

6. The soil erodibility factor used in Reef modelling is based on runoff studies from pasture areas. No Reef science studies have measured and modelled suspended sediment runoff from wooded vegetation areas

Published reef science on suspended sediment runoff to the Reef focus on main causes such as amount of ground cover and location / extent of bare areas in erodible soils such as gullies (Wilkinson *et al* 2012[44], Bartley *et al* 2012[45]).

A study of how ground cover and extent/location of gullies & scalds affects runoff and erosion was conducted over 10 years (Bartley 2014[46]) within eucalypt savannah woodland in the Upper Burdekin at Virginia Park Station, Charters Towers. It measured suspended sediment runoff from flumes across an Indian couch dominant pasture on goldfield soils. The study looked at grazing strategies to improve grazing land condition. Native woody vegetation was Eucalypt savanna woodland (narrow leaved ironbark, bloodwood, currant bush, false sandalwood). Increased ground cover of Indian couch and pasture reduced runoff, however sediment yields were mostly affected by the position of scald, gully and bank erosion areas in the landscape. The amount, distribution and persistence of areas with < 10% ground cover affected the amount of soil erosion. Increased ground cover (> 70%) and rainfall intensity reduced early wet season runoff.

Increasing the abundance of deep-rooted perennial grasses will help reduce runoff from hillslopes which in turn helps to reduce gully and bank erosion in lower sections of the landscape. Riparian vegetation including trees, shrubs and grasses is important in maintaining healthy waterways. Roots help stabilise the banks. Vegetation also helps improve water infiltration, slows down water velocity and provides the last barrier for filtering out sediment and nutrients. However, in cropping and pastoral systems, ground cover determines erosion and runoff risk.

The science now proves that it is ground cover, through grasses and crop stubble, which determines runoff and erosion risk and protects the soil - not tree cover. What we hear from the Environmental groups saying tree clearing affects water quality on the reef is not backed by science. There is generally less ground cover under trees than in cleared areas due to competition for water and nutrient.

[44] Wilkinson SN, Hancock GJ, Bartley R, Hawdon AA, Keen RJ. 2012. Using sediment tracing to assess processes and spatial patterns of erosion in grazed rangelands, Burdekin River basin, Australia. Agric. Ecosyst. Environ. doi:10.1016/j.agee.2012.02.002

[45] Bartley R, Bainbridge ZT, Lewis SE, Kroon FJ, Wilkinson SN, Brodie JE, Silburn M. 2014. Relating sediment impacts on coral reefs to watershed sources, processes and management: A review. Science of the Total Environment. 468-469. 1138-1153.

[46] Bartley R, Corfield JP, Hawdon AA, Kinsey-Henderson AE, Abbott BN, Wilkinson SN, Keen RJ. 2014. Can changes to pasture management reduce runoff and sediment loss to the Great Barrier Reef? The results of a 10-year study in the Burdekin catchment, Australia. The Rangeland Journal 36. 67-84.