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The Cost Effectiveness of Remediating Erosion Gullies in the Fitzroy Basin

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The Cost Effectiveness of Remediating Erosion Gullies in the Fitzroy Basin

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Motivation

- Sediment export to the Great Barrier Reef (GBR) blocks sunlight and prevents the photosynthesis of coral (Brodie et al. 2013).
- The Australian and Queensland governments' have set targets to halt the decline of the GBR (Reef Plan, 2013), which include a 20% reduction in sediment export by 2020.
- Gullies probably make up the largest single contribution to sediment export (Star et al. 2015).
- Cost effectiveness analysis using data from 6 grazing properties in the Fitzroy basin.

Research Questions

1. What is the cost of reducing the sediment generated by gully erosion in the Fitzroy by 1m^3 per year; and
2. Is there evidence for economies of scale in remediation work, that might be used to target funds more efficiently?

Outline

1. The Fitzroy Basin
2. What is Gully Erosion?
3. Summary of Project Gullies
4. Cost Effectiveness Estimates
5. Economies of Scale
6. Conclusions

The Fitzroy Basin



What is Gully Erosion?



Source: <https://www.qld.gov.au/environment/land/soil/erosion/types/>, accessed 18 January 2016

Summary of Project Gullies

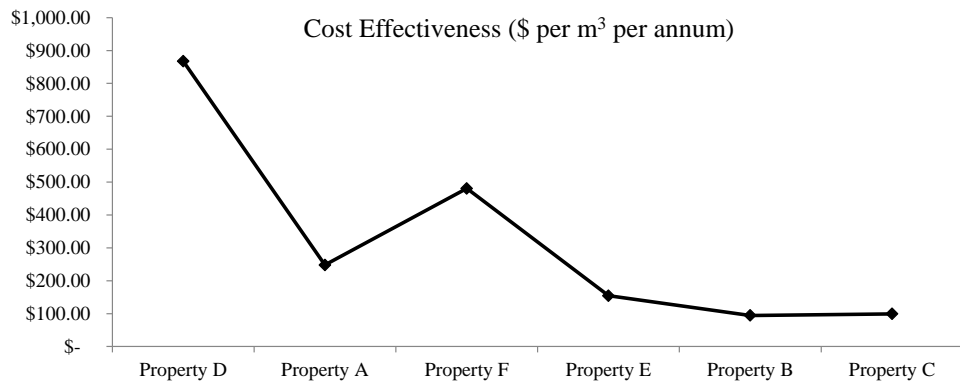
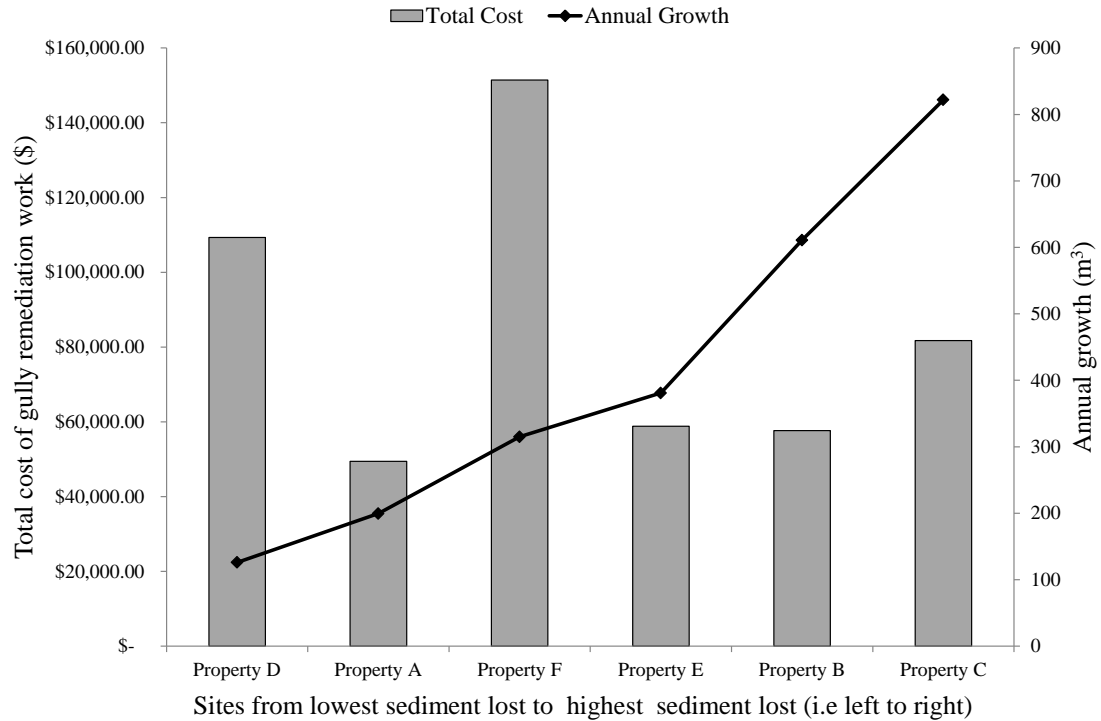
Property	Location	Riparian Gully	Site (ha)	Catchment (ha)	Sediment Lost (m ³)	Annual Growth (m ³)
A	Ogmore	Yes	0.5	31.0	5,320.0	199.5
B	Comet	Yes	12.0	160.0	7,840.0	336.0
			2.0	20.0	5,500.0	275.0
C	Taroom	No	60.0	330.0	9,750.0	507.0
				21.0	5,250.0	315.0
D	Nebo	Yes	7.5	20.0	2,520.0	126.0
E	Springsure	No	4.5	3.0	7,614.0	381.0
F	Clermont	Yes	150.0	20.0	6,300.0	315.0

Cost Effectiveness Estimates

Property	Summary of Work	Total Cost (@ 7% p.a. over 20 years)	Annual Growth (m ³ per year)	Cost Effectiveness (\$ per annual m ³)
A	Some filling and battering, Gravel lip at each gully head, Strategically placed pervious weirs, 1 diversion bank, Fence	\$49,432.88	199.5	247.78
B	Whoa boys on access track, Multiple diversion banks, 5 wire netting silt trap weirs with geo-fabric matting, 2 gravel and geo-fabric matting chutes, Solar power electric fence	\$57,675.85	611#	94.40
C	1 gully silt trap dam, Multiple stick rake lines, 3 diversion banks, Battering of 3 gully heads, Multiple whoa boys, 1 battered rock chute with diversion banks, Solar power electric fence	\$81,727.19	822#	99.42
D	Battering gully head, 1 rock, gravel and geo-fabric matting chute, 2 short diversion banks, 2 large diversion banks, Alternative watering points (troughs, pumps, pipes), Stick rake lines, Fence	\$109,310.68	126	867.55
E	1 diversion bank, Swales across the gully site, Fence	\$58,817.80	381	154.38
F	1 diversion bank, Batter main gully head, Stick rake lines, Whoa boys on an old laneway, Whoa boys and diversion banks on a new laneway, Fence	\$151,401.52	315	480.64

There are two gully sites on these properties and the annual growth reported here is the total sediment loss from both these sites.

Economies of Scale



Conclusion

- 1) Estimated costs from $\sim \$94/(\text{m}^3/\text{year})$ to $\sim \$870/(\text{m}^3/\text{year})$; and
- 2) Our results suggest that the cost effectiveness increases for projects that target a larger volume of gully erosion.

References

- Brodie, J., et al. (2013). 2013 Scientific Consensus Statement: Land use impacts on Great Barrier Reef water quality and ecosystem condition. Queensland, Australia, The Reef Water Quality Protection Plan Secretariat.
- The State of Queensland (2013). Reef Water Quality Protection Plan: Securing the health and resilience of the Great Barrier Reef World Heritage area and adjacent catchments, Reef Water Quality Protection Plan Secretariat
- Star, M., et al. (2015). Prioritisation of neighbourhood catchments in the Fitzroy Basin. Queensland, Australia, Fitzroy Basin Association Inc.

Questions?