

# An Empirically-based sediment budget for the Normanby Basin: Key Findings & Implications

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**Sediment Sinks Sources & Drivers  
in the Normanby Basin**

**CAPE YORK WATER QUALITY**



# Summary (upper catchment sources) i.e. Excl. Coastal plain

	GU 2012 SS I/Ps (t)	%	Previous SedNet*	%
colluvial gully	411800	13%	173000	10%
alluvial gully	736400	24%	0	0%
hillslope delivered	15900	1%	1576000	89%
Mainstem bank erosion	249900	8%	17500	1%
2ndry alluvial channel erosion	1672000	54%	0	0%
<b>total</b>	<b>3086000</b>	<b>100%</b>	<b>1766500</b>	<b>100%</b>
<b>storage</b>	<b>1697300</b>	<b>55%</b>	<b>664000</b>	<b>37%</b>
<b>Net (=18% of terrestrial input to PCB)</b>	<b>1,390,000</b>		<b>1,102,000</b>	

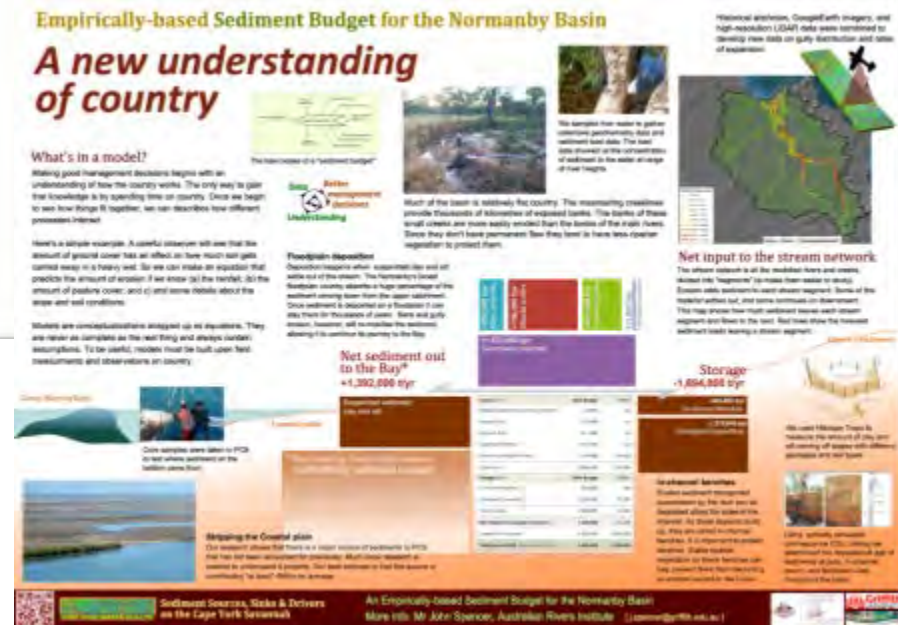
**Coastal plain/delta contrbt'n extra ~4 MT**

# For more details - see

[www.capeyorkwaterquality.info](http://www.capeyorkwaterquality.info)



See also POSTER Displays in Foyer



So what are the implications of these findings?

# Hillslopes like this not the major sediment source area (1-10% - not 90%)

10th Nov 2010 (before 1st storms)  
C= 0.042

30.52 inHg ↑ 32°C 11/16/10 03:00 PM 0050000000

23rd Nov 2010 (after 1st storms)  
C= 0.040

30.72 inHg ↓ 32°C 11/23/10 03:00 PM 0050000000

7th Dec 2010  
C= 0.035

30.52 inHg ↓ 36°C 12/07/10 03:00 PM 0050000000

24th Dec 2010  
C= 0.0244

30.38 inHg ↓ 30°C 12/24/10 03:00 PM 0050000000

4th Jan 2011  
C= 0.020

30.52 inHg ↓ 35°C 01/04/11 03:00 PM 0050000000

18th Jan 2011  
C= 0.0177

30.46 inHg ↓ 28°C 01/18/11 03:00 PM 0050000000

1st Feb 2011  
C=0.015

30.58 inHg ↑ 34°C 02/01/11 03:00 PM 0050000000

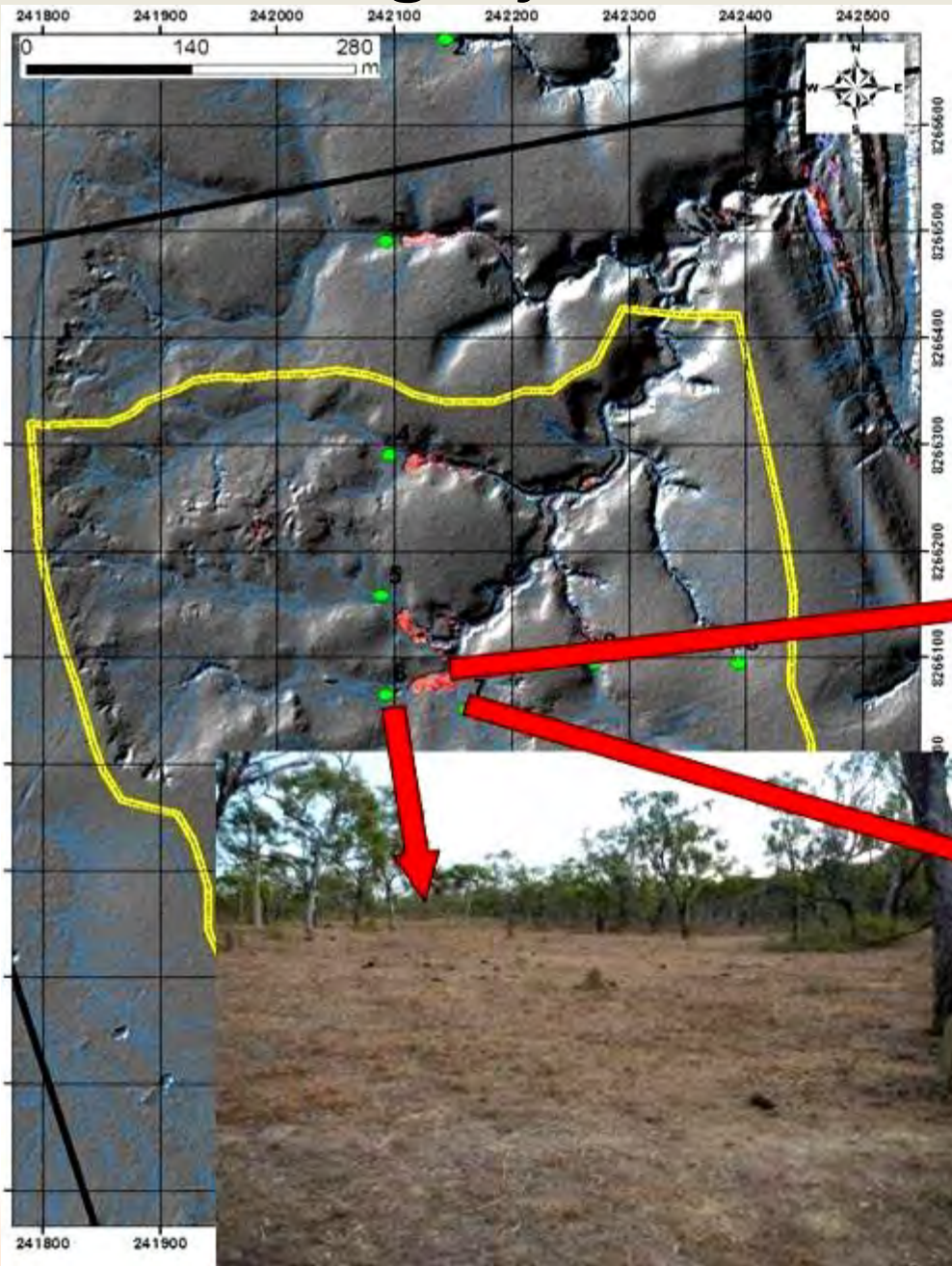
14th Feb 2011  
C= 0.0083

30.72 inHg ↓ 34°C 02/14/11 03:00 PM 0050000000

13th Mar 2011  
c=0.0053

30.66 inHg ↓ 34°C 03/13/11 03:00 PM 0050000000

# Alluvial gully erosion like this is a major source



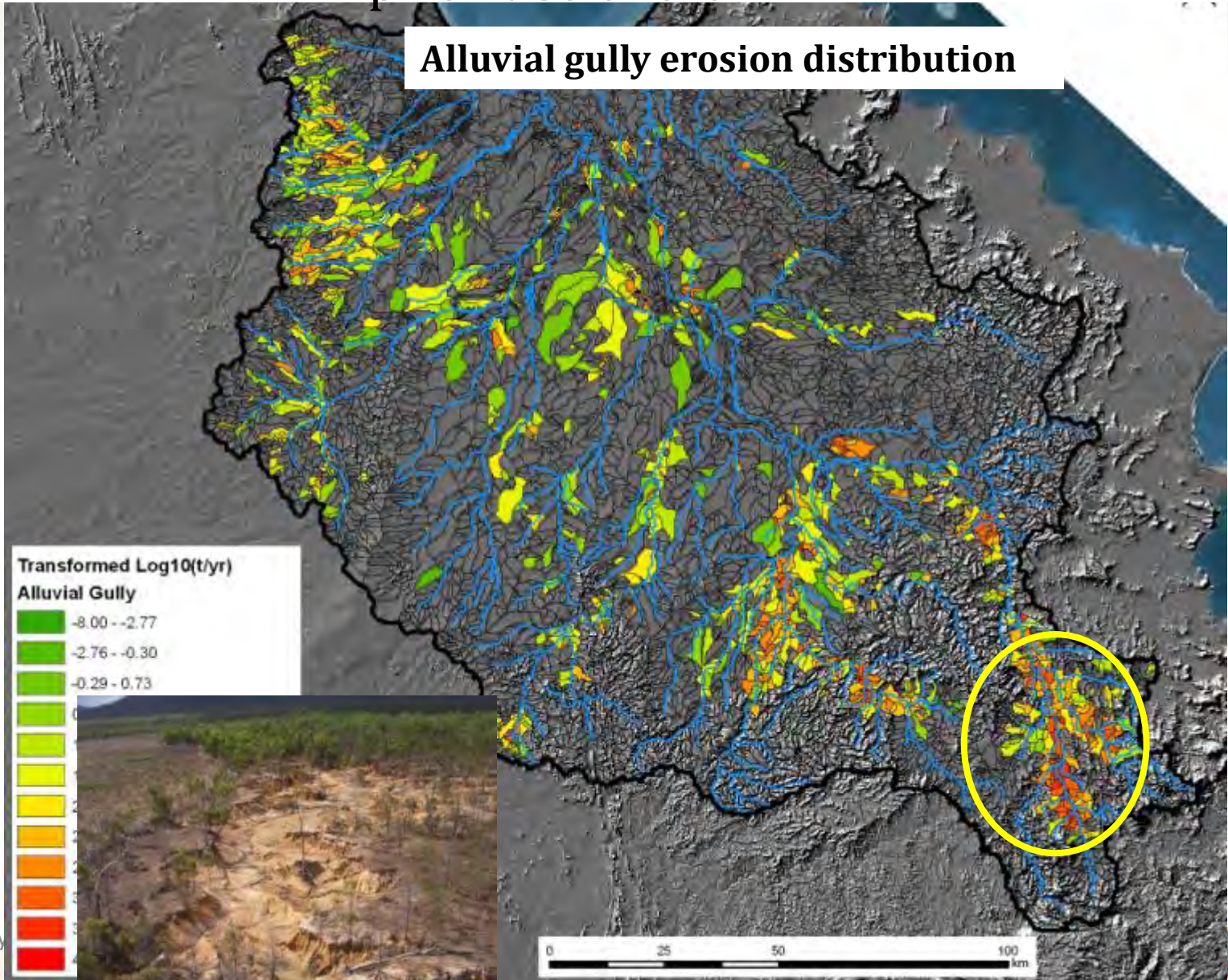
Laura River at Crocodile Gap (Norm 16)



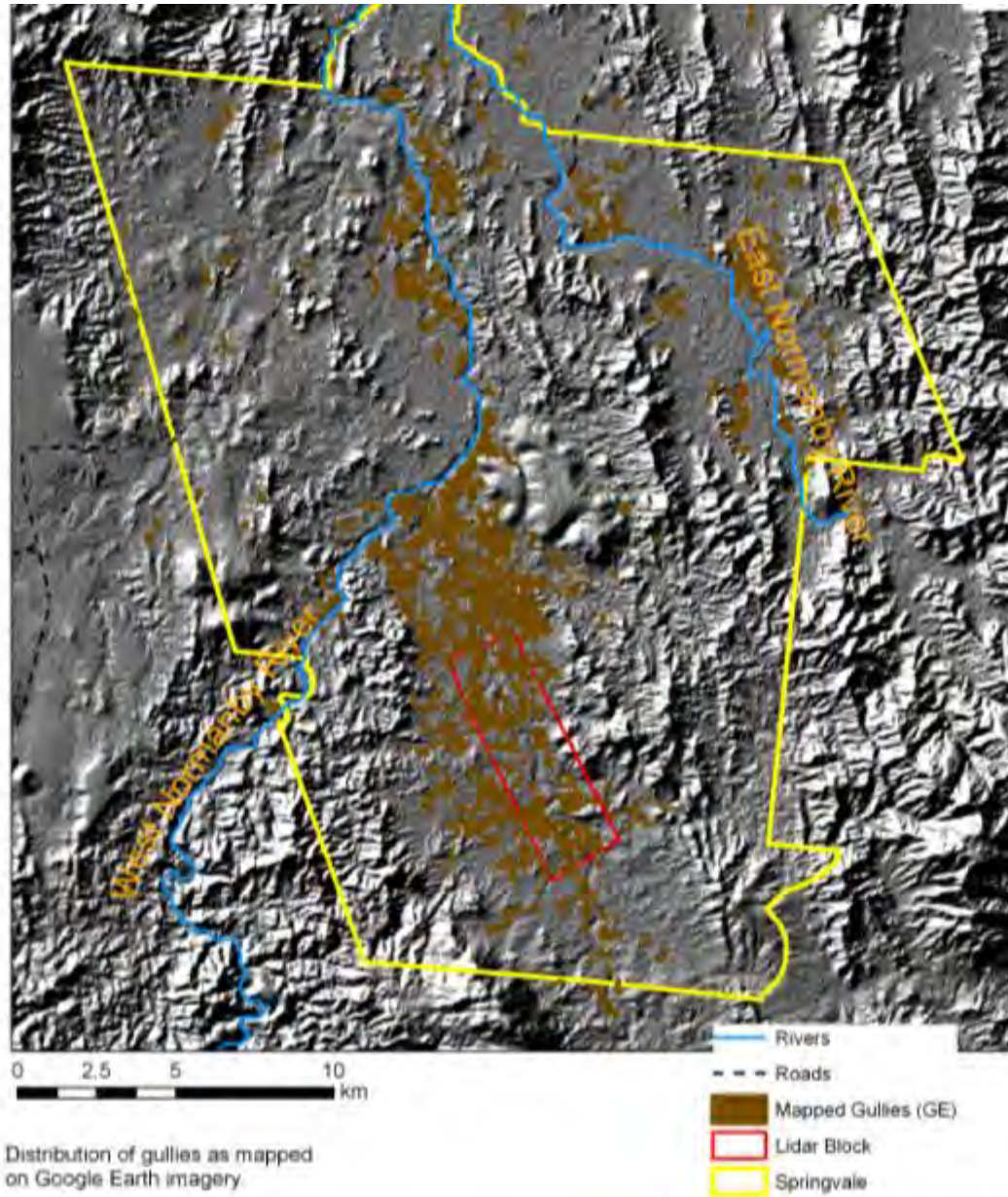
Photos Jeff Shellberg

# Can now identify accelerated erosion hotspots and better prioritise effort

## Alluvial gully erosion distribution



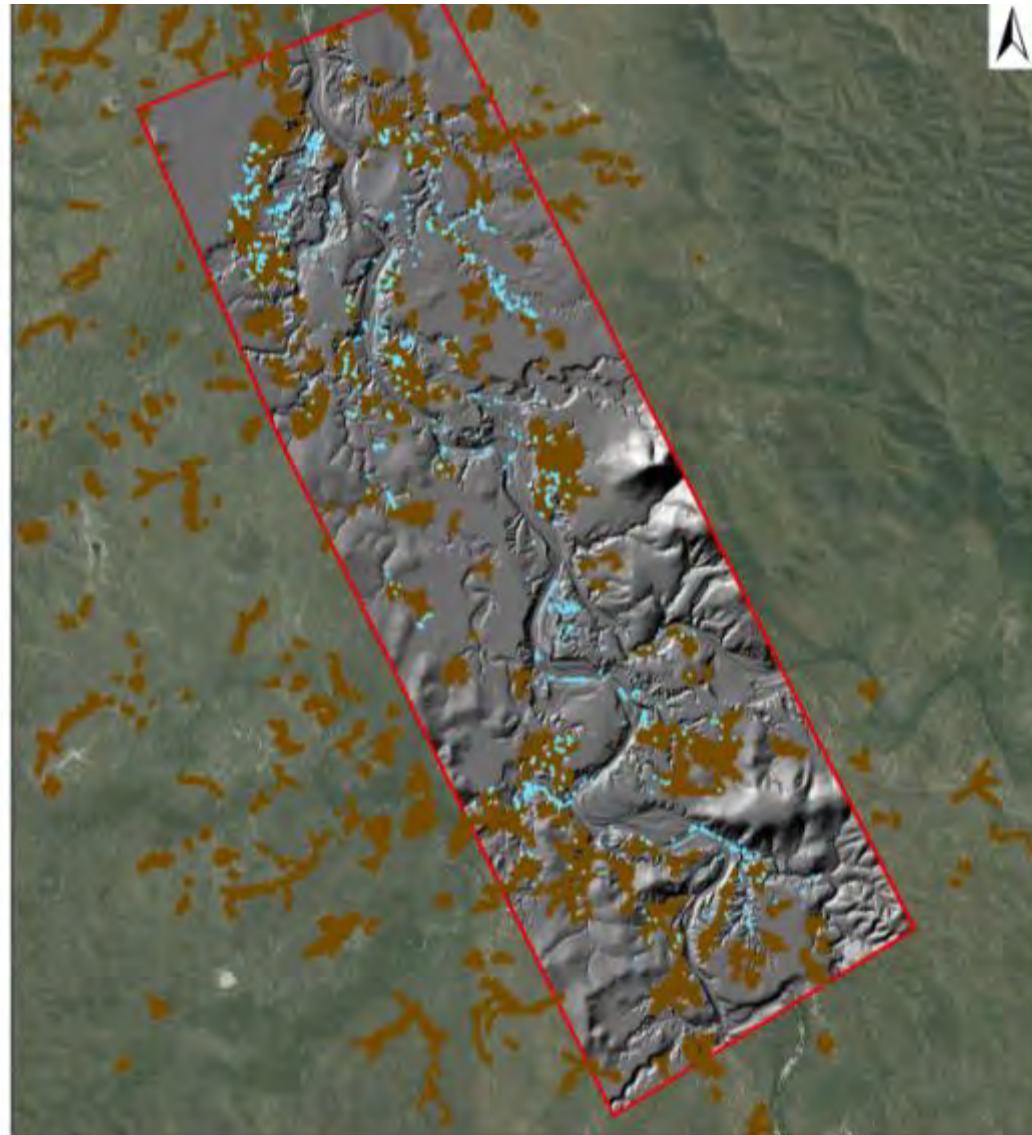
At a property scale we can identify areas of major erosion and use this as a basis for planning new management approaches



Distribution of gullies as mapped on Google Earth imagery.



In areas where we have repeat LiDAR – we can potential target individual “problem gullies” or gully clusters.



0 0.5 1 2  
km

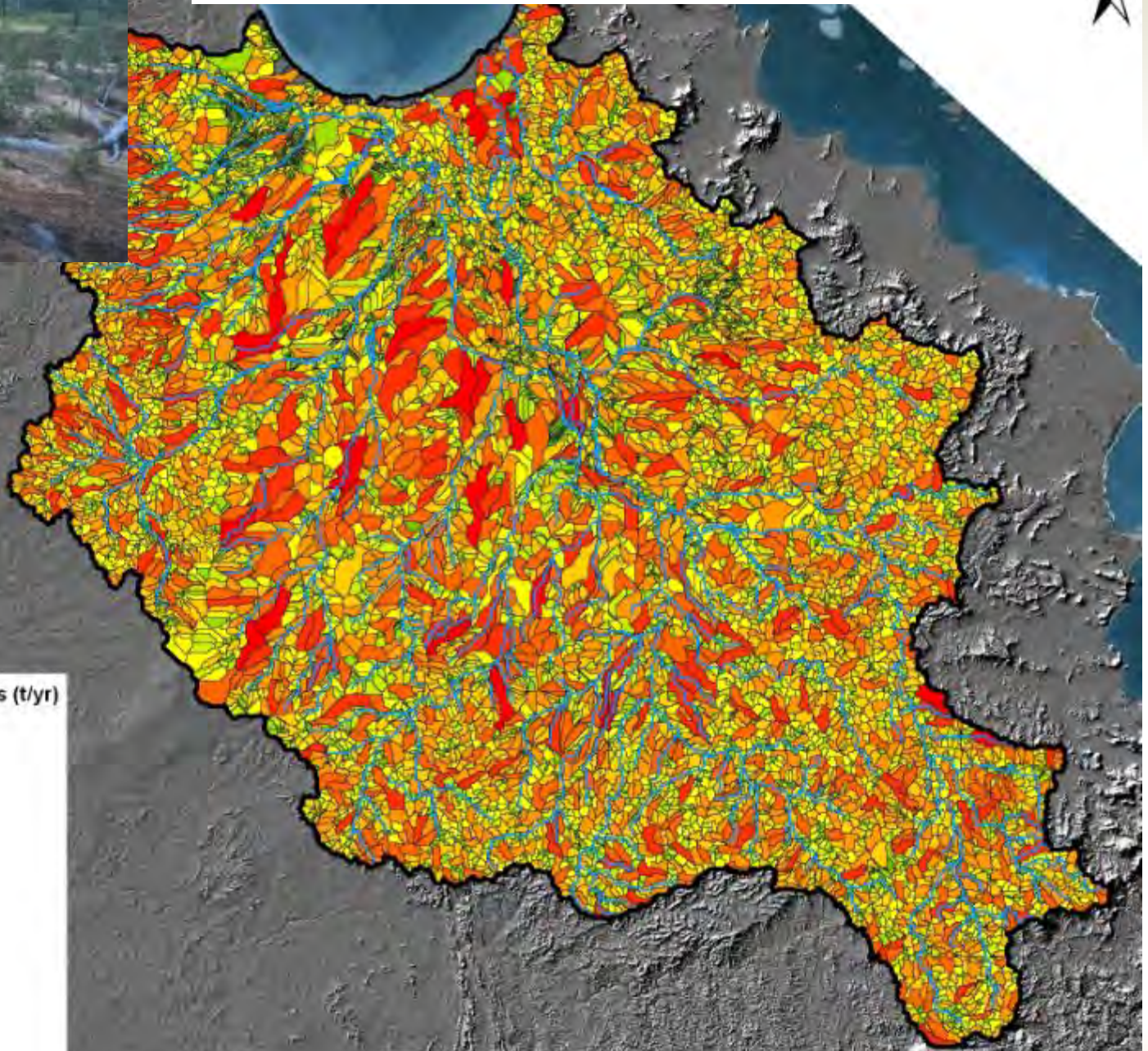
This map shows polygons of material eroded between lidar acquisition in 2009 and 2011 overlain on distribution of gullies as mapped on Google Earth imagery.

- Measured Erosion
- Mapped Gullies (GE)
- Lidar Block
- Springvale

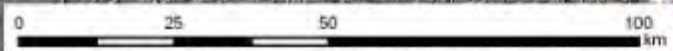
# Channel erosion from ubiquitous small channels also a major source



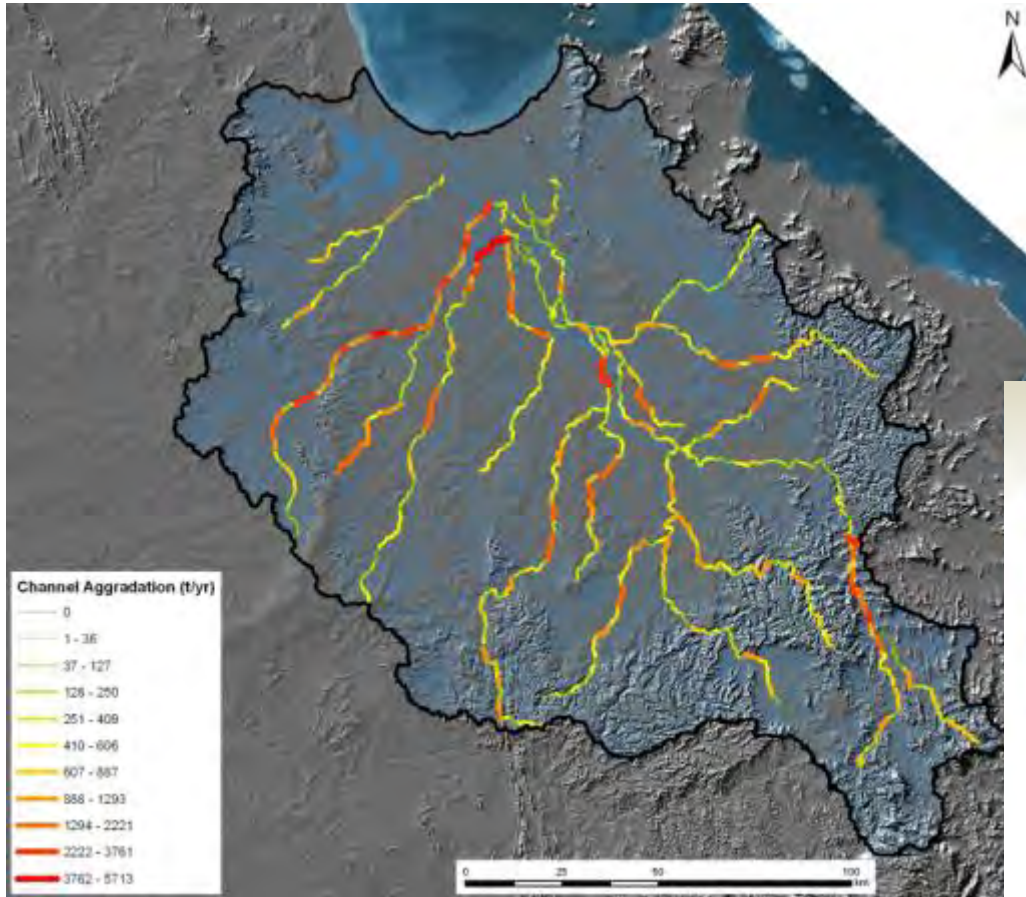
# Minor alluvial channel bank erosion



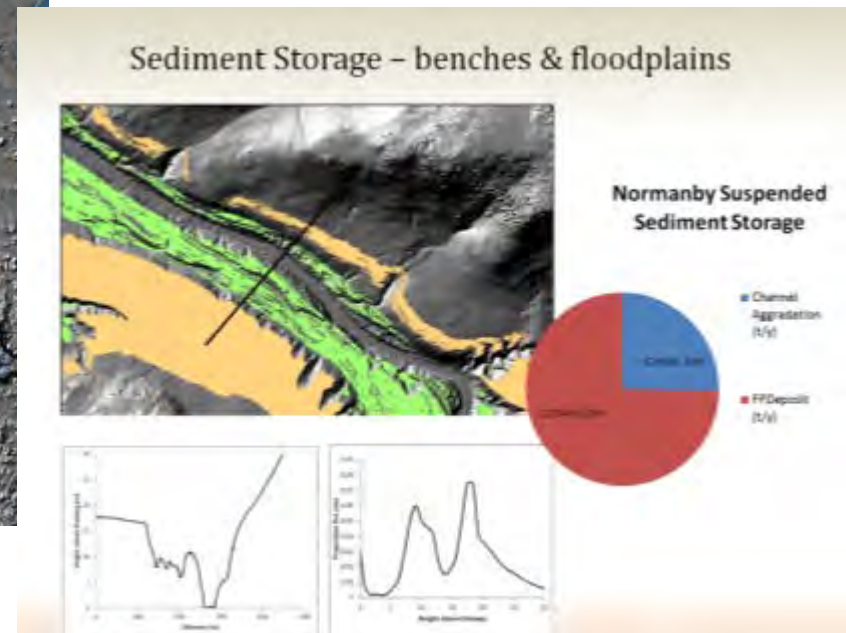
## Secondary Channels (t/yr)



# Need to factor in-channel storage into modelling and management strategies



How important is bench storage in other GBR catchments?



# Management approach quite different under the two scenarios (i.e. Old & New model)

- Catchment cover management (e.g. GLM) only part of the solution..(hydrologic link to channel/gully erosion)
- Need a range of other measures
  - Riparian zone management is key
    - Reducing the potential for initiating new alluvial gullies
    - Reducing bank erosion due to direct disturbance by cattle (particularly)
    - Increasing vegetation in gullies & on banks
    - Maximising storage within channels
    - Reducing potential for remobilising sediment deposited within the channel zone (benches)

# Need to focus management efforts & R&D on gullies & river banks

Rehabilitation of alluvial gully erosion along river frontages  
**Preventing and Reducing 'Breakaways'**

www.capeyorkwaterquality.info

**Stop erosion drivers**

1. Reduce Water Runoff Into Gullies

**Build erosion resistance**

2. Increase Vegetation in Gullies
3. Reduce Slope (Grade) of Gully Channels

**Install water diversion/retention banks above gully heads**  
 - Divert excess water to safe disposal areas

**Fence river frontage away from high banks**  
 - Full cattle exclusion or wet season spelling

**Reduce cattle pads over steep banks**  
 - Reduce water concentration

**Install grade control structures**  
 - Only at narrow gully outlets or finger headcuts

**Increase perennial grass cover on river flats**  
 - Cover Target: >75% at BOS  
 - >1000 kg/ha  
 - Reduce water runoff

**Active rehabilitation of gully slopes**  
 - Re-grade gully slopes with machinery  
 - Apply gypsum to soils with high sodium content  
 - Add compost or mulch for soil protection  
 - Add fertilizer or compost for plant nutrients  
 - Sow gully with perennial grass (native or exotic)

**Fire management in river frontage**  
 - Cool winter fires (3-5 yrs), infrequent hot fires

**Increase grass cover in gullies**  
 - Fence out cattle  
 - Aerial, hand or spray grass seed in the wet season

**Weed management and control**

**Sediment Sources, Sinks & Drivers on the Cape York Savannah**

Rehabilitation of alluvial gully erosion (breakaways) along river frontages  
 More info: Dr Jeff Shellberg, Australian Rivers Institute [jshellberg@griffith.edu.au]

CAPE YORK WATER QUALITY

in the Normanby Basin

CAPE YORK WATER QUALITY

See poster display

# What is driving coastal erosion in PCB?

- What threat – if any - does an additional  $\sim 4\text{Mt/yr}$  that we didn't know about pose to the reef?
- Climate change?
- Do other catchments have coastal erosion sources such as this?

See poster display



# To what extent has RUSLE-based modelling over-predicted hillslope erosion in other GBR catchments?

- Are rivers like the O'Connell really dominated by hillslope erosion?
- Or are other processes like bank erosion more significant?

Need to revisit models & critically review all model assumptions

Need a major investment in measuring soil erodibility (K factors)





# How significant are roads as human induced sediment sources in other GBR catchments?

## Roads send sediment straight into the streams

*Bare, unsealed road surface in the Normanby Basin is at least 5676 ha.*

*This makes roads the largest intensive landuse in the Basin (around 2000 ha more than the horticulture area around Lakeland).*

*The road network crosses the stream network at least 1,200 times, creating direct pathways for the input of sediment to streams.*

**How many crossings are there?**

*No one actually knows: water crossings have never been surveyed.*

We did a preliminary mapping using Google Earth and 1:100K stream network data (Gleeson, 2012). Roughly, we can estimate there are over 1,200 places where unsealed roads cross a stream line. The map shows different road classes and the stream intersection points (black dots).

Many older farm tracks are not visible through GoogleEarth and the real stream network is more extensive than the 1:100K network resolution. So we're certain that the estimated number here is far lower than the actual figure.

*Sediment runoff from roads at stream crossings is a significant problem. Better road design and improved maintenance are urgently needed.*

*A researcher collects and measures fine sediment deposited in a small channel downstream of a road crossing.*

*Direct road runoff is bad enough, but there's another problem. A study on secondary unsealed roads showed that 42% of drains had initiated gullies such as these.*

# Still a number of unquantified inputs



Hort – rill erosion



Roads



Pigs



Fences

# There are a range of more specific implications for how we measure and/or model these large savannah catchments... this is just a start.

## Thankyou

- Acknowledgements:

This project is funded through the Federal Govt Reef Rescue Program in partnership with Cape York Sustainable Futures (CYSF) & Cape York Marine Advisory Group (CYMAG) , Rainforest Reef Research Centre (RRTC)

Thanks to Isha Segboer & Trish Butler (CYSF), Ian & Malcolm McCollum (CYMAG), Sheriden Morries (RRTC), Jane Waterhouse (C20), Ron Harrigan (Normanby Station), Darryl Paradise (Kings Plains Station), Damian & Bridget Curr (Springvale Station); Jason Carroll (Sthrn CY Catchments), Amanda Hogbin (OLKLA Corp), The Laura Rangers, Ted & Sue Lee, Bungie Scott, & many others....

