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Sediments Q&A

Q. Why is sediment a concern?

A. Sediments arising from soil erosion are affecting the health of the Great Barrier Reef by reducing light that plants and coral need to grow. The fine soil particles that are discharged from rivers and resuspended during the year can increase turbidity in the Great Barrier Reef. Increased turbidity can block out the light that corals and seagrass need to photosynthesise.

Q. Where does it come from?

A. Most suspended sediment discharged from rivers to the Great Barrier Reef originates from grazing lands of the Burdekin, Fitzroy and Burnett Mary regions (Waterhouse et al., 2012). Surface soil erosion due to low pasture cover followed by soil lost from gullies and stream and river bank erosion all contribute to to loss of suspended sediment into the Great Barrier Reef (Waterhouse and Brodie 2011; Kroon et al. 2012).

Q. Why is more sediment reaching the reef today than in the past?

A. Vegetation helps prevent erosion from pastures and cropping land and can trap sediment before it enters river systems. Vegetation loss due to land clearing has led to increased sediment loads in our rivers.

Recent estimates (Kroon et al. 2012) indicate that since European settlement the average annual load of suspended sediment has increased by approximately 5.5 times with majority of this sediment coming from the Fitzroy and Burdekin regions.

Coarse sediment is mostly retained near the coast, e.g. in sandbars (Brodie et al., 2012b). However, fine sediment settles on the seabed and is continuously re-suspended in shallow waters by wind and tidal currents and transported north along the coast (Radke et al. 2010). It is the finer sediments are considered to be the most damaging to the health of the reef (Brodie et al., 2012a; Bainbridge et al., 2012) and estimates from recent research (Brodie et al 2012) indicate that fine sediments remain in the Great Barrier Reef for a long time – from months to years.

Recent research (Fabricius and Wolanski, 2000; Bainbridge et al. 2012) has shown that fine sediments and associated nutrients in flood plumes aggregate to form a muddy 'snow' which can smother corals and seagrass.

Q. Why is it a problem?

A. The impact of increased suspended sediment in the marine environment is well known, with much of the knowledge coming from research funded under the MTSRF and now under the NERP. Potential impacts of high sediment loads include:

- reduced coral settlement and death of coral polyps (Fabricius 2005)
- reduced coral recruitment rates (the number of corals entering adult stage) and coral biodiversity, with many sensitive species being diminished or absent in communities exposed to high sediments, e.g. species richness of soft corals and sea fans declines by up to 60% as turbidity increases (Fabricius and De'ath 2004)

- loss of sea grass through reduced light (Collier et al. 2012)
- higher turbidity negatively interferes with settlement, feeding and behavior of juvenile fish (Wenger et al., 2011; 2012)

It takes a long time to undo the damage of soil erosion. Erosion control mechanisms in grazing lands (such as riparian fencing, wet season spelling, reduction in stocking rates to match available pasture) will have a water quality benefit at the paddock scale after two or three wet seasons, at a local scale within five to 10 years, more than 10 years at the sub-catchment scale, over 50 years at the end of catchment and even longer at the estuarine and marine scale.

Fine sediments can also prolong the influence of nutrients in turbid waters as the nutrients are attached to the sediment and can become available over much longer time periods following the high flow events (Fabricius et al., 2012).

References

Bainbridge Z.T., Wolanski E., Alvarez-Romero J.G., Lewis S.E. and Brodie J.E. (2012) *Fine sediment and nutrient dynamics related to particle size and floc formation in a Burdekin river flood plume, Australia*. **Marine Pollution Bulletin**.

Brodie, J., Wolanski, E., Lewis, S., & Bainbridge, Z. (2012a). *An assessment of residence times of land-sourced contaminants in the Great Barrier Reef lagoon and the implications for management and reef recovery*. **Marine pollution Bulletin** 65(4-9), 267.

Brodie JE, Kroon FJ, Schaffelke B, Wolanski EC, Lewis SE, Devlin MJ, Bohnet IC, Bainbridge ZT, Waterhouse J, Davis AM (2012b) *Terrestrial pollutant runoff to the Great Barrier Reef: An update of issues priorities and management responses*. **Mar Poll Bull** 65: 81-100

Collier C.J., Waycott M. & Ospina A.G. (2012) *Responses of four indo-west pacific seagrass species to shading*. **Marine Pollution Bulletin** 65, 342–354.

Fabricius, K.E. and De'ath, G. (2004) *Identifying ecological change and its causes: a case study on coral reefs*. **Ecological Applications** 14: 1448-1465.

Fabricius K.E. (2005) *Effects of terrestrial runoff on the ecology of corals and coral reefs. Review and synthesis*. **Marine Pollution Bulletin** 50, 125-146.

Fabricius, K. E., De'ath, G., Humphrey, C., Zagorskis, I., & Schaffelke, B. (2012). *Intra-annual variation in turbidity in response to terrestrial runoff on near-shore coral reefs of the Great Barrier Reef*. **Estuarine, Coastal and Shelf Science**.

Kroon F.J., Kuhnert K.M., Henderson B.L., Wilkinson S.N., Kinsey-Henderson A., Brodie J.E. & Turner R.D.R. (2012) *River loads of suspended solids, nitrogen, phosphorus and herbicides delivered to the Great Barrier Reef lagoon*. **Marine Pollution Bulletin** 65, 167-181.

Middelburg J.J. & Herman P.M.J. (2007). *Organic matter processing in tidal estuaries*. **Marine Chemistry** 106, 127–147.

Radke L.C., Ford P.W., Webster I.T., Atkinson I., Douglas G., Oubelkheir K. Li J., Robson B. and Brooke B. (2010) *Biogeochemical zones within a macrotidal, dry-tropical fluvial-marine transition area: a dry-season perspective*. **Aquatic Geochemistry** 16, 1–29.

Waterhouse J. and Brodie J. (Compilers) (2011) *Identification of priority pollutants and priority areas in the Great Barrier Reef catchments*. Synthesis Report prepared for the Marine and Tropical Sciences Research Facility (MTSRF) with contributions from S. Lewis, P. Kuhnert, M. van Grieken, M. Devlin and their research teams. Published by the Reef & Rainforest Research Centre Ltd, Cairns (82pp.).

Waterhouse, J., Brodie, J., Lewis, S., & Mitchell, A. (2012). *Quantifying the sources of pollutants in the Great Barrier Reef catchments and the relative risk to reef ecosystems*. **Marine Pollution Bulletin** 65(4),

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