South East Queensland Floods

Mud, nutrients and coral

Newsletter #4, January 2012

During the January 2011 flood, millions of tonnes of soil were washed from the upper catchments into the Brisbane River by fast flowing flood waters. The soil formed a brown plume which extended from the river mouth into Moreton Bay. As the flow of the water slowed, fine soil particles (mud) settled within the Brisbane Estuary and Moreton Bay. As a result, many kilometres of the once sandy bottom of the Bay are now covered by a thick mud layer loaded with nutrients, such as phosphorus and nitrogen.

This newsletter explores the short and long term impacts of the mud and nutrients on aquatic habitats, and the animals and plants living within them. The impacts include:

- Mud smothering the bottom of Moreton Bay
- Excess nutrients and nuisance algae blooms
- Corals with signs of stress such as bleaching.

Flood plume impacts on aquatic habitats

An increase in soil and mud in a waterway can have significant impacts on aquatic habitats. These include:

- **Nutrients** (nitrogen and phosphorus) attached to soil particles are released over time into a waterway. This leads to increases in phytoplankton (microscopic plants) and nuisance algae blooms which feed on the excess nutrients.
- **Smothering** of seagrass and coral occurs as the soil settles on the bottom of a waterway. This reduces the availability of light which affects the ability of plants, such as seagrass and the algae living within corals, to produce food. Soil in the water also clogs fish gills leading to disease and, in extreme cases, death.
- **Food availability** decreases as aquatic plants die due to smothering. This effects the growth and survival of fish, turtles and dugongs that rely on plants for food.
- **Changes in habitat structure** occur as mud settles onto the bottom of the Bay, filling spaces between gravel and rocks. This decreases the amount and type of habitat available for animals that live within these crevices.

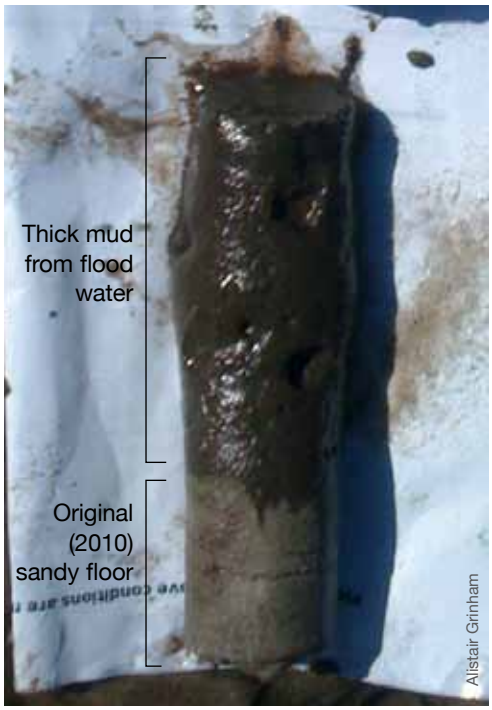
A thick plume of mud extended from the river mouths in western Moreton Bay across to the eastern side of Moreton Bay.

HEALTHY WATERWAYS

Highest levels of turbidity since monitoring began

Scientists measure turbidity to determine the amount of soil present in the water. During January 2011, turbidity readings reached their highest levels since monitoring began over 10 years ago. As the amount of soil increases so does the turbidity, lowering the clarity of the water. During the months following the flood, turbidity levels decreased as the soil settled forming a mud layer on the bottom of the Brisbane Estuary and Moreton Bay.

Up to 2.4 million tonnes of mud, enough to fill 50,000 dump trucks, was removed from the Brisbane shipping channel alone. This area accounts for only 5% of Moreton Bay. To determine the depth and extent of this mud across the rest of the Bay, core samples have been taken. As expected, the distribution and percentage of mud in the Bay has increased significantly since initial sampling was undertaken in 1999 (Figure 1 and 2).



A sediment core taken after the flood shows approximately 10cm of thick mud covering the once sandy bottom of Moreton Bay.

1999

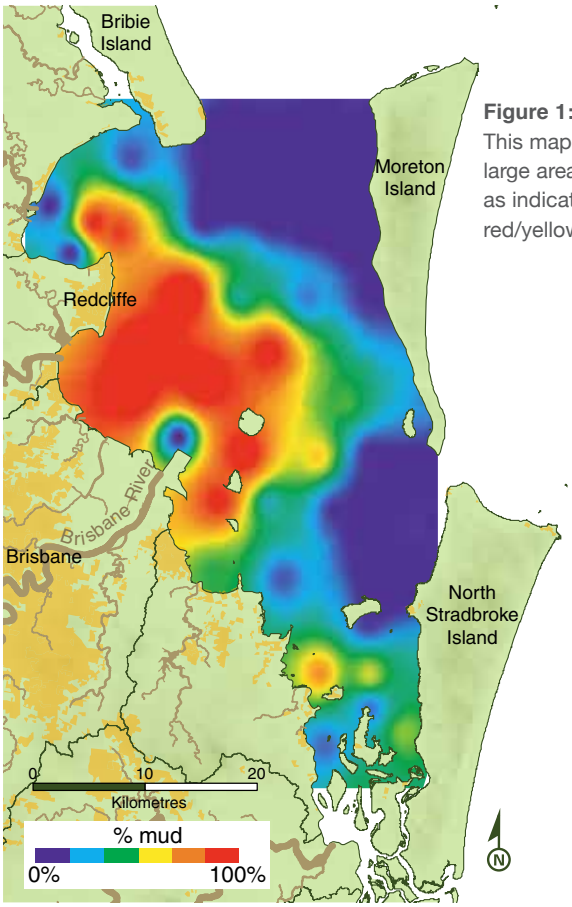


Figure 1: This map shows a large area of mud, as indicated by the red/yellow.

2011

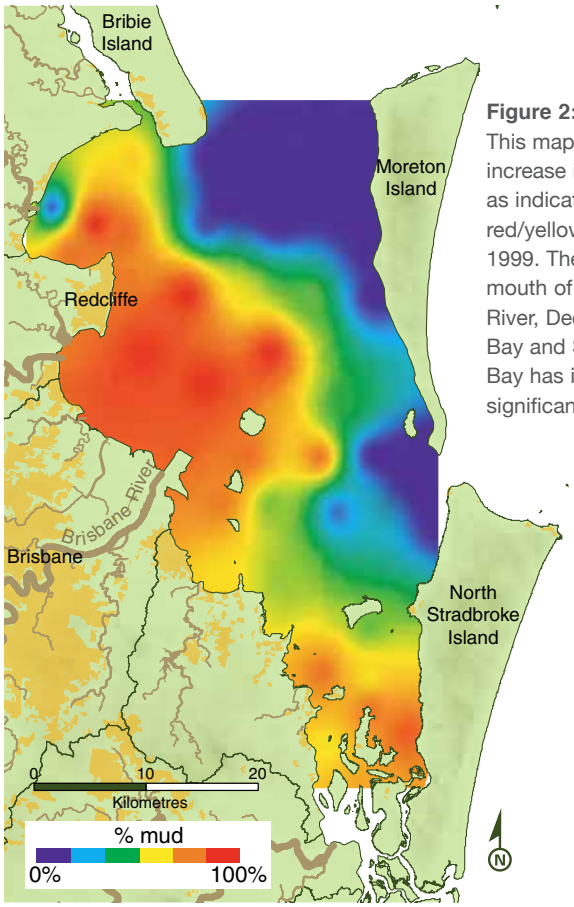


Figure 2: This map shows the increase in the mud, as indicated by the red/yellow, since 1999. The mud at the mouth of the Brisbane River, Deception Bay and Southern Bay has increased significantly[2].

Flood affected areas release higher levels of nutrients

A recent investigation has found that flood affected areas of Moreton Bay are releasing high levels of nutrients into the water[3]. Two sites, one in Western Bay (impacted by the flood) and one in Eastern Bay (not impacted by the flood) were monitored for changes in nutrient (nitrogen and phosphorus) levels in February and May 2011.

The release of nutrients in Western Bay during February was much higher than in Eastern Bay for the same month. Interestingly, in May the release of nutrients from the Western Bay had noticeably decreased. This is probably due to the slowing of nutrient processing as water temperatures fall during Autumn. Also, by this time the majority of easily available nutrients may have already been released.

However, an increase in nutrient levels is expected to reoccur in Western Bay during the summer months. This is due to warmer weather and winds, which resuspend the mud particles, increasing turbidity and the release of nutrients.

Scientists have been out in Moreton Bay collecting samples, such as sediment cores throughout the year since the flood.

References

1 Heggie, D. et al. (1999). Task sediment nutrient toxicant dynamics (SNTD) Phase 2 Final Report, South-east Queensland Water Quality Strategy.

2 Data was collected and analysed by Dr Alistair Grinham, University of Queensland

3 Data was collected and analysed by Paul Maxwell, a PhD student at Griffith University, under the supervision of Prof. Rod Connolly and Dr Kylie Pitt.

4 This data was collected and analysed by Andrew Olds and Michael Parker, students at Griffith University, under the supervision of Prof. Rod Connolly and Dr Kylie Pitt.

Excess nutrients can cause nuisance algae

Algae need the right conditions, plenty of nutrients and sunlight, to bloom. Following the flood, algal growth was suppressed in most areas of Moreton Bay as turbid water reduced light availability. However, a phytoplankton (microscopic plant-like organisms) bloom occurred on the edge of the plume in February. A few months later a dense area of *Lyngbya* (toxic blue-green algae) was reported on seagrass meadows in the eastern part of the Bay. The expected increase in nutrients during the warmer months will increase the likelihood of nuisance algal blooms, such as *Lyngbya,* and phytoplankton within Moreton Bay.

Lyngbya blooms (dark area) on Amity Banks in eastern Moreton Bay.

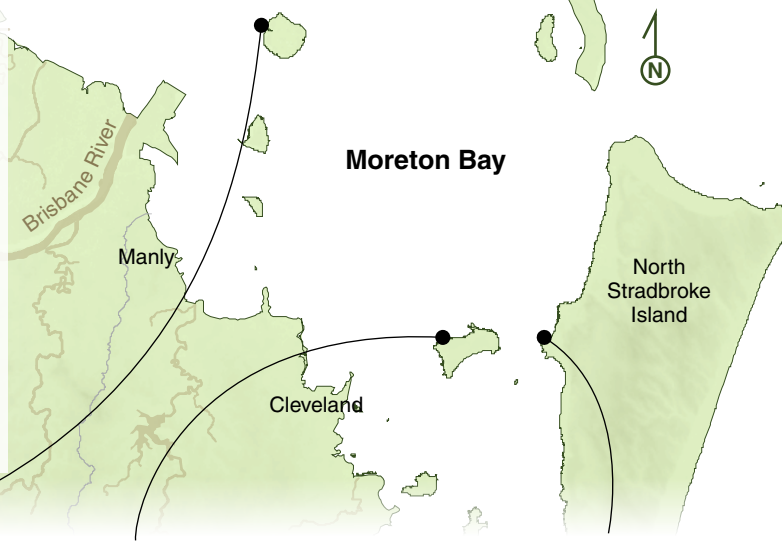
Water sample collected from eastern Moreton Bay on 26 February 2011 showing extreme levels of phytoplankton.

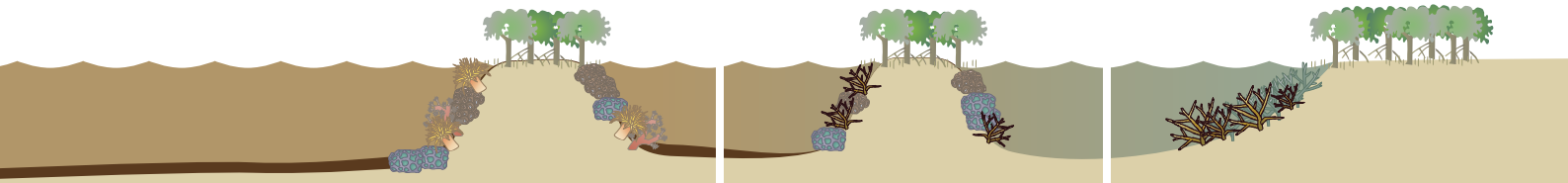
Moreton Bay coral showing signs of stress

Coral bleaching within Moreton Bay

Corals living in Moreton Bay have been affected by the flood and are showing signs of stress, such as bleaching. The proportion of bleached coral is consistent across the Bay from the west (heavily impacted and dominated by more robust corals) to the east (less impacted and dominated by sensitive corals). Across the Bay, 2-10% of coral were affected by bleaching post flood, despite the eastern side of the Bay being less affected by the flood plume.

Coral bleaching occurs when the colour producing algae (zooxanthellae) living in the coral is expelled or dies. An increase in freshwater, turbidity and nutrient levels during and following the flood is the likely cause of the coral bleaching. The loss of coral will affect many fish species which use this habitat for shelter. Further monitoring will determine whether corals recover or continue to decline[4].





	Mud Island	Peel Island	North Stradbroke Island
Species present:	soft coral and brain coral	brain coral and branching coral	branching coral
Impact from flood waters:	high	medium	low
Sensitivity to turbid water:	low	medium	high
Post-flood bleaching:	medium	medium	medium

Photos: (March 2011)

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For more information about the waterways of South East Queensland please visit Healthy Waterway's website:
www.healthywaterways.org
Front banner: Bleached *Acropora* species from Myora in the Eastern Bay, Andrew Olds
Back banner: Brain coral from St Helena Island, Andrew Olds