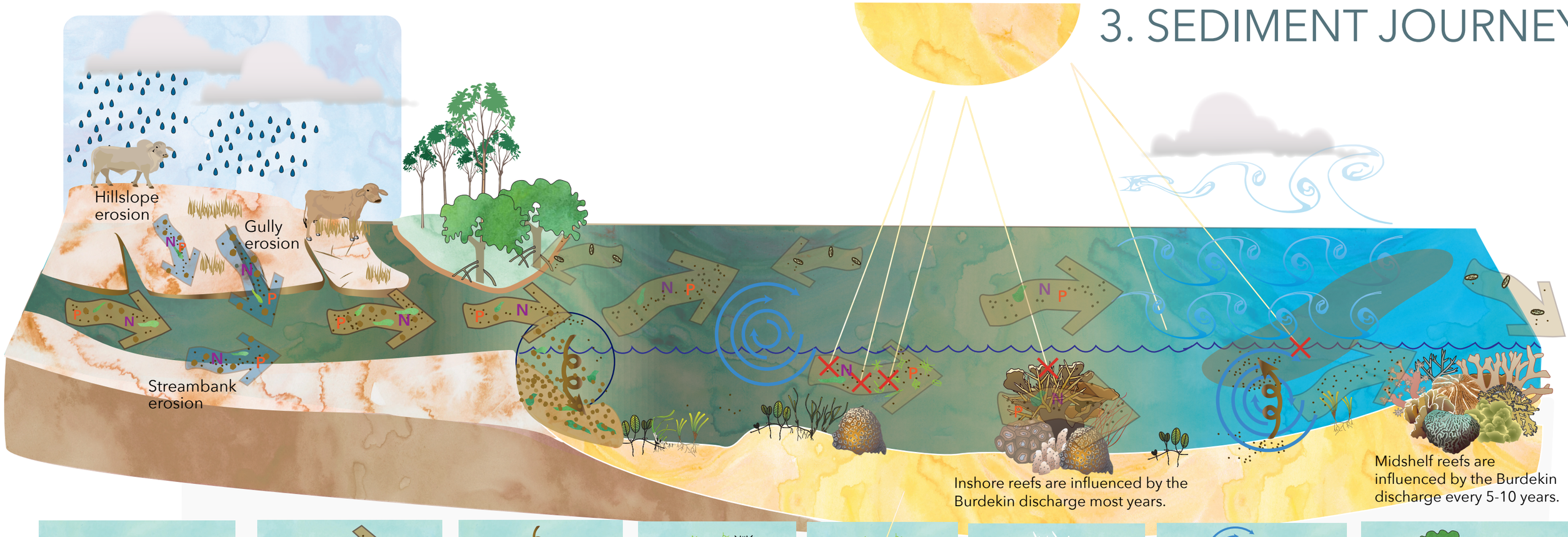
3. SEDIMENT JOURNEY



Erosion moves soil from land

Rainfall breaks up and moves soil particles, particularly in vulnerable soil types with sparse groundcover. Hillslope scalds, gullies and bank erosion expose soil, which can be washed into waterways, along with dissolved and particulate nutrients.

Rivers transport sediment and nutrients

Bacteria in waterways break down some of the particulate nutrients, turning them into a more easily transported dissolved form that travels further out to the Great Barrier Reef.

Large particles drop out

Most soil particles (coarse, medium and fine), along with particulate nutrients, drop out at the river mouth. A portion of the fine particles continue on with the flood plume into the central Great Barrier Reef.

Fine particles form flocs

Nutrients on fine sediment feed bacteria, fungi, phytoplankton and zooplankton growth. This organic material grows around and becomes attached to the fine particles, forming organic rich floc aggregates.

Flocs block light

Flocs block vital sunlight from reaching seagrass and coral communities. Dissolved nutrients in the plume stimulate algal growth which can also block light.

Flocs stress coral

Flocs can settle on coral surfaces. Bacteria digest these organic rich flocs and bloom, using up oxygen causing the coral surface to become anoxic and acidic. Flocs also block vital light. These impacts stress coral and can cause tissue death within a short time.

Wind resuspends flocs

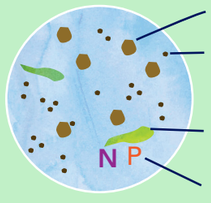
The flood plume lasts a few weeks until the flocs settle out. However, subsequent high winds and tides can resuspend and transport the flocs, impacting water clarity. Resuspended flocs continue to block light to coral and seagrass and cause stress to these communities over the following months.

Flocs disperse and break down

Over the course of about a year flocs are progressively resuspended, broken down and dispersed by currents. Flocs are gradually carried into deeper areas where they are no longer subject to resuspension. Some flocs can also be carried into coastal areas by onshore winds and tides, and can potentially end up as mud in mangroves and estuaries.

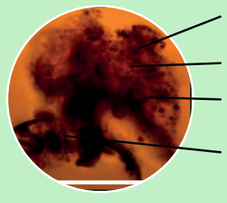
Scientific research helps us to understand these issues

Particles in water



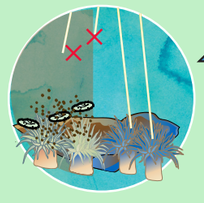
- Large soil particle
- Fine soil particle
- Particulate nutrients are attached to soil particles or comprise pieces of dead plant or animal matter
- Dissolved nutrients (nitrogen and phosphorus)

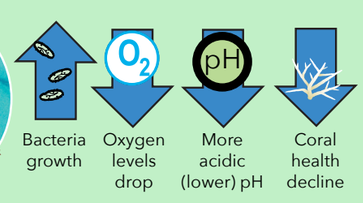
Components of a floc



- Fine soil particle (<16µm)
- Organic material
- Bacteria / Fungi
- Plankton (microscopic plants and animals)

How flocs stress coral





Generally corals are able to remove coarse sediment (e.g. sand) and particles with low organic content that settle onto them. However, organic rich sediments (flocs) are stickier and can swiftly cause decline in coral health. Organic rich sedment is identified as a key cause of the degradation of coral reefs exposed to run-off from the land.

Knowledge gaps show priorities for future research

Knowledge gap:
What type of fine sediment is found in flocs and can this be traced back to a specific catchment source?

Knowledge gap:
What causes flocs to form? In particular, how do fine sediment particles, associated organics and particulate and dissolved nutrients (nitrogen and phosphorus) interact?

Knowledge gap:
The impact of increased particulate nutrient loads to the marine environment is not well understood. Three key knowledge gaps that need to be explored are:
1. What proportion of land-derived particulate nutrients are able to be broken down (i.e. mineralised and available for use by marine organisms)?
2. How long does it take for particulate nutrients to be broken down?
3. Once particulate nutrients are broken down, how far can they disperse in the marine environment and what area can they affect?