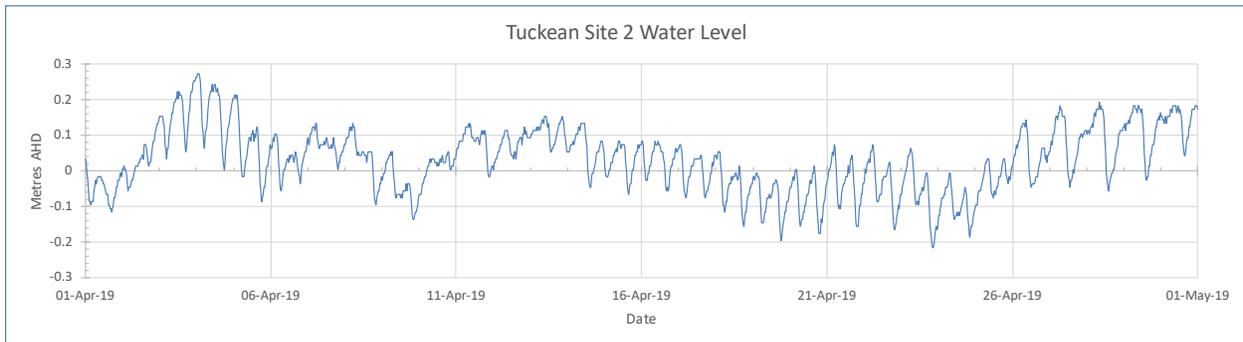
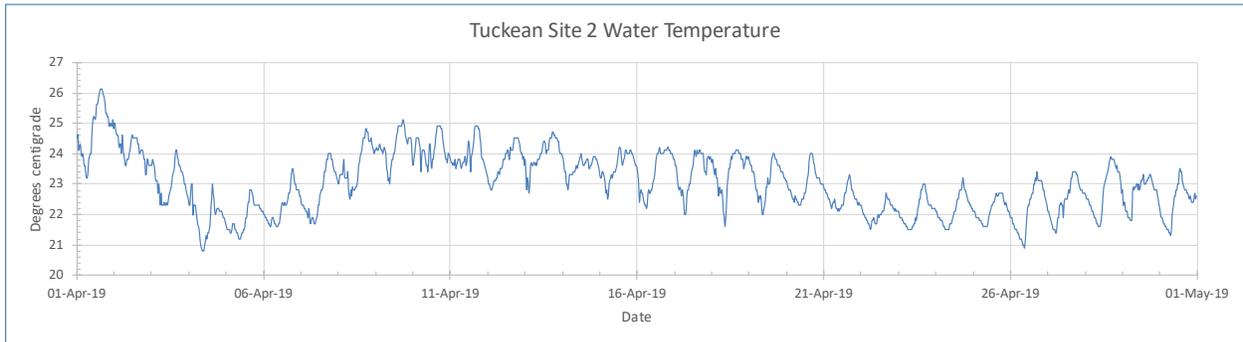
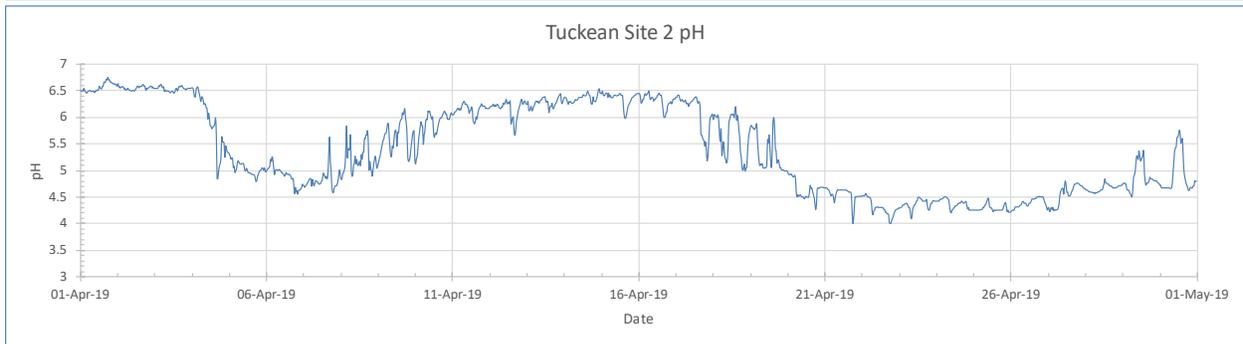
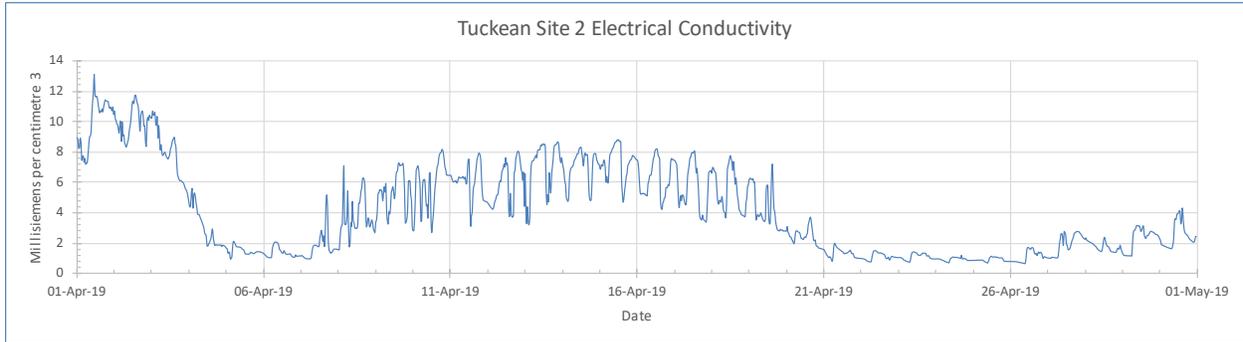
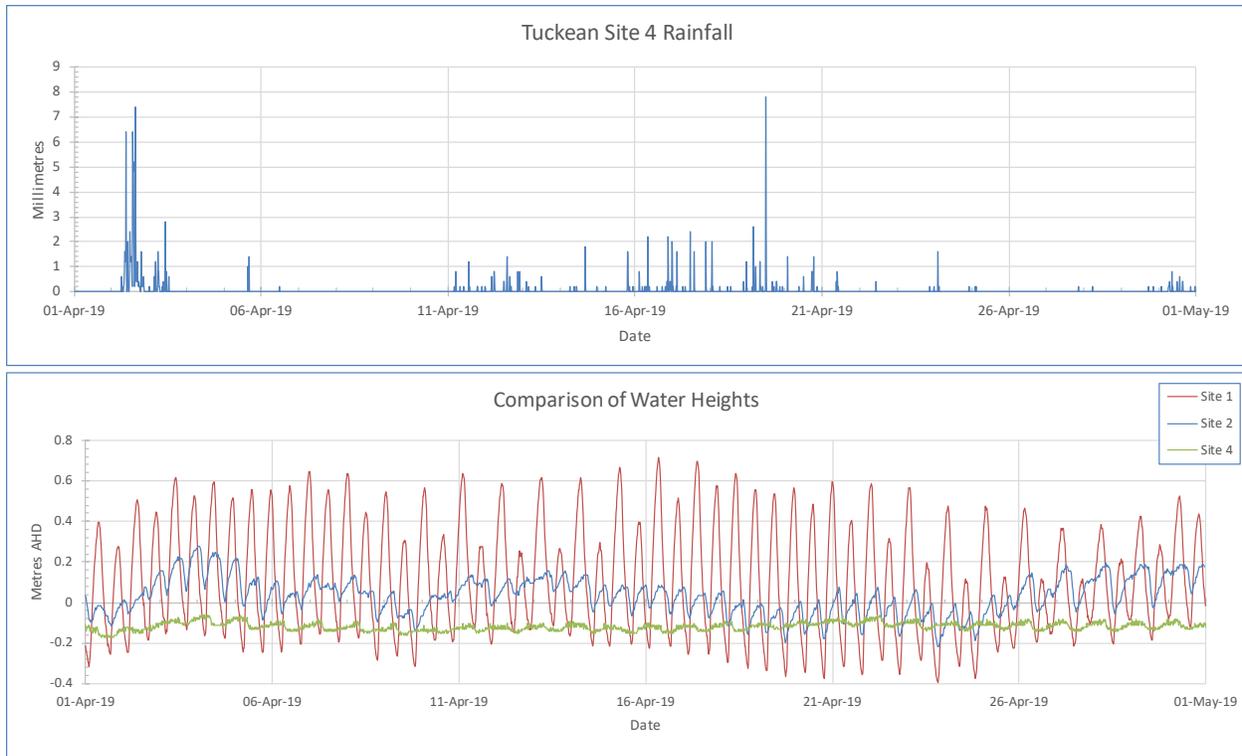


Tuckean site 2 water quality – April 2019

Data logger located upstream of Bagotville Barrage, Tuckean Swamp, NSW





Interpretation

The logger was cleaned and calibrated on 17th April.

On the 24 April, around 30 dead fish were found at the Bagotville Barrage. The fish were on both side of the Barrage and had been dead for a few days, some were decomposing. They were mainly Mullet, all in between 20-30cm long. There were no obvious marks on the fish.

Rous County Council staff advised NSW DPI Fisheries and other relevant stakeholders and monitored water quality. Council's dataloggers in the area show a small discharge event was occurring at the time with slightly lowered salinity levels and pH readings. For the five days following, dissolved oxygen ranged been 3.60 and 4.90 mg/L and pH ranged between 5.2 and 5.49 (on discharging tides). Laboratory analysis of water discharging when the fish were found, show elevated aluminium levels. This is common in areas with large-scale disturbance of acid sulfate soils, like the Tuckean Swamp.

Whether water quality was a factor in the fish's death, is not known. Healthy schools of fish were seen swimming in the Barrage area on the day the fish were found and afterwards. No further dead fish were found, and the event is considered localised. The reason why the fish died or where they died is not known.

The sluice window on the Barrage was opened further by Rous County Council from 150mm to 500mm to increase tidal exchange and assist in improving water quality in the area. The sluice was opened on Wednesday 24 April and lowered back to 250mm on Friday 3 May because of concerns of higher tides.

- **Electrical conductivity (EC)** was recorded in April between 0.8 and 13.1 ms/cm averaging 4.1 which is brackish and has fallen by 13.1 compared to the March saline average of 17.2 ms/cm due to increased rainfall and reduced tidal influence. EC is directly related to salinity and is the inverse

of electrical resistance in ohms. Water is considered fresh if below 1.8 ms/cm, brackish from 1.8 – 4.8 and saline above 4.8 with seawater approximately 60 ms/cm.

- **pH** was recorded in April between 4.0 and 6.7 with an average of 5.4 which has fallen by 1.0, which is equal to ten times the acidity of the March average of 6.4 due to increased rainfall and acid discharge from drains. On the pH scale neutral is at pH 7 and for every consecutive whole number below 7 acidity increases by ten times on a logarithmic scale. The Tuckean Swamp is an acid sulfate environment therefore pH is affected by surface and groundwater level, drainage, rainfall, runoff and tidal exchange.
- **Water temperature** was recorded in April between 20.8 and 26.0 deg C averaging 23.1 which has fallen by 4.1 compared to the March average of 27.2°C due to increased cloud cover and seasonal change. Water temperature normally peaks in the late afternoon as air temperature and solar radiation decreases. Temperature variations can be caused by a combination of factors including solar radiation, air temperature, tidal exchange, day /night, riparian shade, turbidity and rainfall.
- **Water level** recorded in April ranged between -0.22 m and +0.27 m giving a range of 0.49 m and averaging +0.03 m which is equal to the March average of +0.03 m. Levels are yet to be surveyed in to Australian Height Datum (AHD). Water height at site 2 fluctuates with tides, barrage leakage, degree of sluice gate opening, river height, rainfall in the catchment and to a lesser extent temperature, wind and barometric pressure.
- **Rainfall:** In April the site 4 data logger situated 4 km to the north recorded 164.6 mm over 23 days which compares to 166.6 mm recorded over 17 days in March. Peak 15-minute rainfall of 7.8 mm was recorded between 11:30 am and 11:45 am on 19th April. The April 33-year average for this location is 185.6 mm therefore rainfall is below average. During April the Rocky Mouth Creek data logger located 19 km to the SSW recorded 211.8 mm over 23 days, while the Ballina AWS located 19 km to the NE recorded 158.8 mm over 21 days.
- **Water height comparison**
The April site 2 average was 0.09 m lower than the site 1 average of + 0.12 m and 0.15 m higher than the site 4 average of -0.12 m. Due to restricted water entry at the barrage sluice gates maximum daily tidal variation at site 2 was 0.22 m compared to 0.91 m at site 1. This compares to the maximum daily tidal variation of 0.06 m at site 4, which is 6.6 km upstream as a result of restrictions in the drains. The water height at site 4 is mostly below site 2 indicating drainage has ceased while drainage at site 2 only occurs within approximately 200 mm of low tide. Although rainfall has increased in April, groundwater levels remain low due to low summer rainfall and high evaporation and transpiration. Low groundwater on the swamp exposes acid sulfate soils which oxidise to form sulfuric acid. If the soil becomes saturated from heavy rainfall, mobilised acid can be washed into drains resulting in an acid event capable of killing fish and causing red spot disease.