# Gympie – Amamoor Waterwatch Report

# 2010 – 2011

Mary River – Dagun Pocket, January 2011

Report prepared by:

Brad Wedlock, Steve Burgess & Eva Ford

MRCCC Catchment Officers

June 2011

*This report prepared with the assistance of the Gympie Regional Council Environment Levy*

## Introduction

The volunteers of the Gympie-Amamoor Waterwatch network have collected water quality data for more than 8 years which is now providing the community, scientists and government agencies with a better understanding of the characteristics of the waterways in this part of the Mary River catchment. Without this committed volunteer effort we would not have access to this valuable information.

It is sad to have to report on the loss of one of our first Waterwatch volunteers; Eddie Gresham, who diligently collected data from the Mary River and Kybong Creek since 2003 and continued until shortly before he passed away. Eva has fond memories of careering across muddy paddocks with Eddie on his quad checking out old sites and looking for a new site to monitor on the Mary River!

This past year saw a La Nina weather cycle which produced levels of flooding not seen in many years, and severe damage to some parts of the catchment. Many families and their properties, including Waterwatch volunteers, were directly affected by the floods and we extend our thoughts and wishes to these people.

Minor levels of flooding started in March 2010, and by Christmas 2010 the entire Mary Catchment was saturated. Repeated summer floods culminated in the January 2011 floods. Along the Mary River and in some creeks there was severe scour, erosion and damage to vegetation due to the very rapid and sustained stream height rises.

Since the floods, there appears to be a general improvement to the water quality of the waterways within the network. Anecdotal comments written on the datasheets reflect this general improvement in stream health (not withstanding the damage caused by the 2011 floods). However native in-stream aquatic plants and riparian vegetation are taking some time to recover, while weeds have colonised the bare areas created by the floods.

Only data from currently active sites are included in this report, which presents the long term data for each site and an indication of change since the last report in 2010. There is now enough long-term data from many sites to draw some statistically valid conclusions about differences in general physical and chemical characteristics of water quality between a number of sub-catchments in this area of the catchment. At some sites there is also enough data to develop local water quality guidelines in accordance with the Queensland water quality guideline procedures.

Due to the high risk to personal safety we don't encourage Waterwatch volunteers to collect water quality data during floods. Consequently the Waterwatch data does not capture the water quality impacts during the large flood events. MRCCC has commenced recording flood event data using specialised sampling programs and in-stream dataloggers on the middle reaches of the Mary River.

The MRCCC water quality report card methodology has been designed for the Waterwatch data (physical-chemical water quality datasets), and does not yet incorporate flood related water quality data or other aspects of stream health eg. riparian condition. The flood data from 2011 has to be considered seperately to evaluate the impact of the flood events on the environment.

Eddie Gresham on the Mary River

**Waterwatch sites monitored in the Gympie - Amamoor Waterwatch Network**

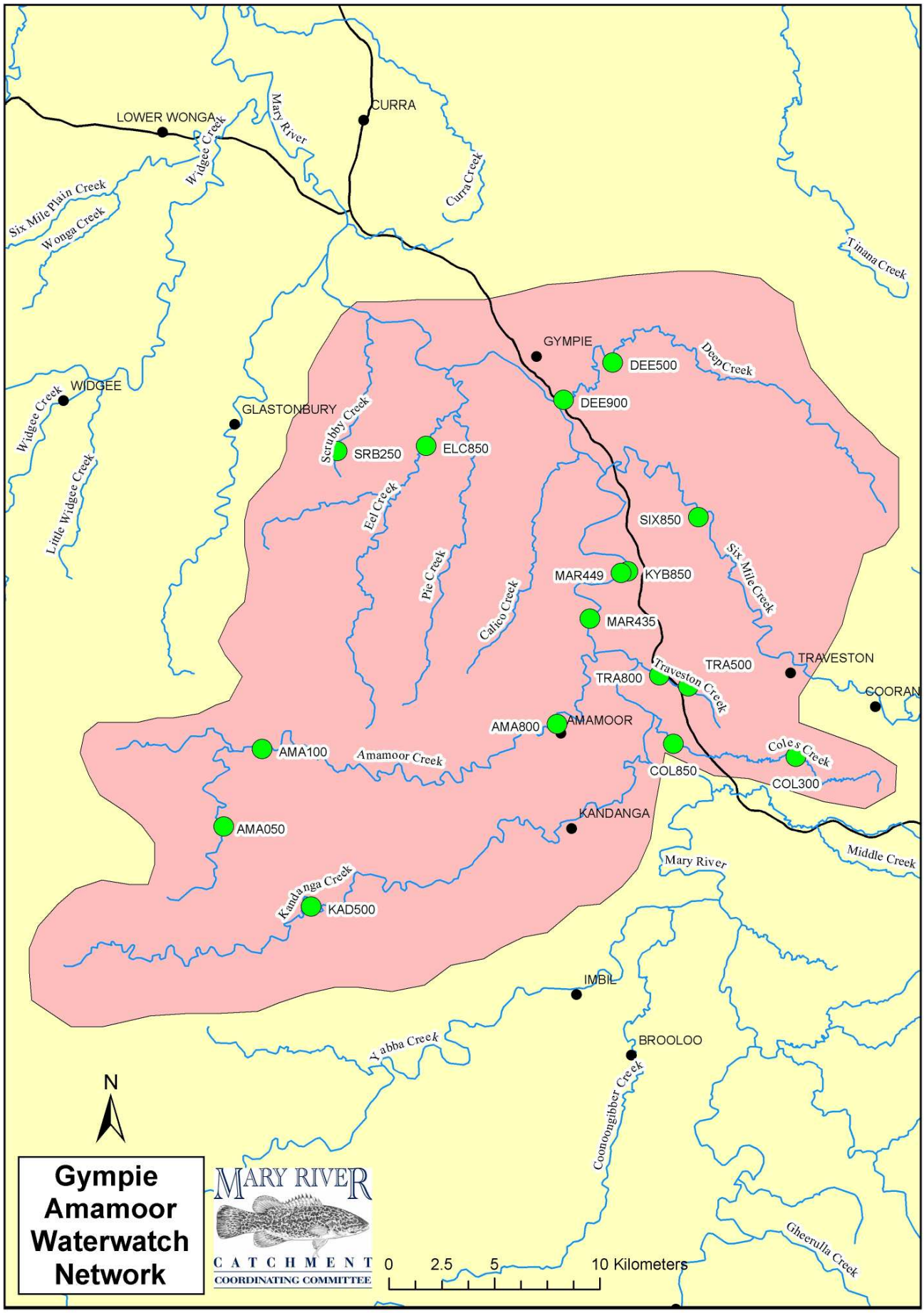
| Gympie & Amamoor Waterwatch Network | | |
|---|---|---|
| **Site Code** | **Creek Name** | **Location** |
| AMA050 | Amamoor Creek | South branch, Bluebell |
| AMA100 | Amamoor Creek | Bluebell |
| AMA800 | Amamoor Creek | Amamoor township |
| COL300 | Coles Creek | Coles Creek Road |
| COL850 | Coles Creek | Carlson Road |
| DEE500 | Deep Creek | Randwick Rd, East Deep Creek |
| DEE920 | Deep Creek | Bruce Highway, Gympie |
| DEE950 | Deep Creek | mouth with Mary River, Gympie |
| ELC850 | Eel Creek | Long Rd, Pie Creek |
| KAD500 | Kandanga Creek | Upper Kandanga |
| KYB850 | Kybong Creek | Bruce Highway, Kybong |
| MAR435 | Mary River | Gilldora |
| MAR449 | Mary River | Kybong |
| SRB250 | Scrubby Creek | Scrubby Creek Rd, Scrubby Creek |
| SIX850 | Six Mile Creek | Woondum bridge, Mothar Mt |
| TRA500 | Traveston Creek | Traveston Rd, Traveston |
| TRA800 | Traveston Creek | Traveston Crossing Rd, Traveston |

## Volunteers

A new volunteer joined the Gympie – Amamoor Waterwatch network during 2010. Will Kingham from Bluebell, in the upper Amamoor Creek catchment is now testing this part of the creek.

The MRCCC extends our thanks to the dedicated Waterwatch volunteers past and present for their continued effort, assistance and involvement in the Waterwatch network during 2010-11. Contributors to this report are: Eddie Gresham, Col & Kath Robinson, Craig & Leslie Hanson, Bob & Lorraine Hood, Kent Hutton, Bob Fredman, Lorne & Ross Maitland, Noo Dye, Will Kingham, Nick's Readymix, Shane Litherland, Graeme Draper, Dagun Mill and the Amamoor Store.

## Gympie Amamoor Waterwatch Map



**December 2010 & January 2011 floods**

The summer of 2010/11 was characterised by a series of rapid rises in the creeks and Mary River culminating in the large extended flood event of January 2011. The earlier flood events in 2010 had the effect of softening the creek and riverbanks and weakening vegetation in the riparian zone, resulting in extreme damage to some parts during and after the extended flood event in January 2011.

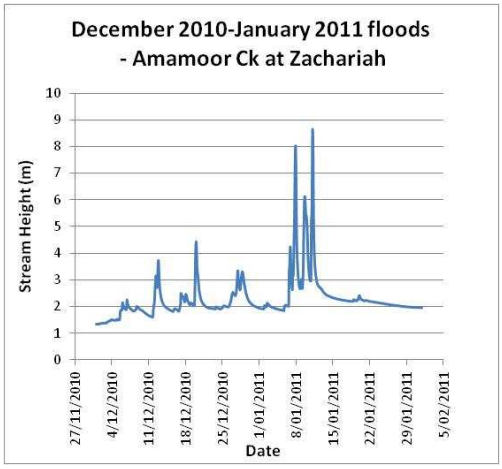
While the Mary River at Gympie experienced a major flood event it was only in the order of a 1 in 20 year flood event (see appendix), however the flood event in Wide Bay Creek at Kilkivan and Woolooga was the highest level yet recorded. The duration of the January flood event in the middle Mary River in the vicinity of Gympie was sustained for several weeks. This followed a situation where there had already been significant bank collapses as a result of sustained higher river heights throughout November and December 2010. Amamoor and Kandanga Creeks experienced sharp stream height rises and falls similar to those in Wide Bay, Widgee and Glastonbury Creeks in early January 2011.

Water levels recorded during summer 2010/11 are shown for :

1. Amamoor Creek, at Zachariah
2. Six Mile Creek, at Cooran
3. Mary River, at Moy Pocket

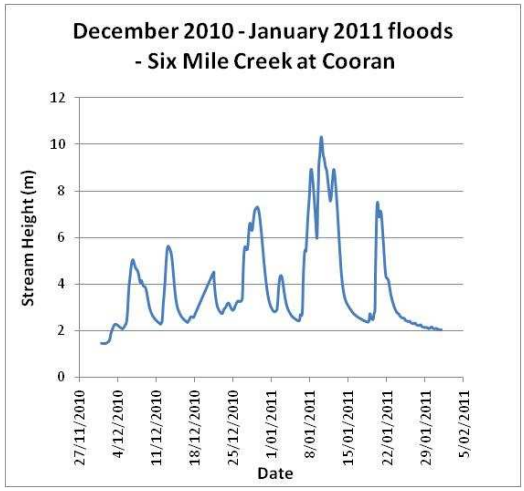
**1. Amamoor Creek, at Zachariah**

Characterised by several highly erosive flood events during December, however the January event showed several very rapid rises which caused an extreme amount of damage to the riparian zone and infrastructure eg. roads and bridges.



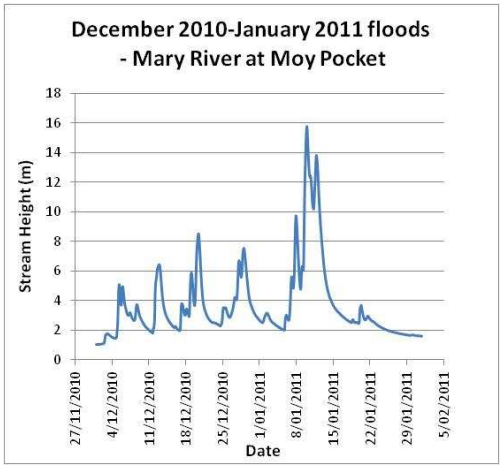

**2. Six Mile Creek, at Cooran**

Characterised by many rises and falls throughout December and January. However the early January flood event was not much bigger than the flood events following in January. The January flood event was not as pronounced as in the western sub-catchments.




**3. Mary River, at Moy Pocket**

Characterised by four sharp rises and falls in the river during December, and three larger rises close together contributing to the early January 2011 flood. A considerable amount of sand was shifted and deposited as a result of this series of flood events. The flood peak at Moy Pocket was the 3rd highest recorded since 1963.

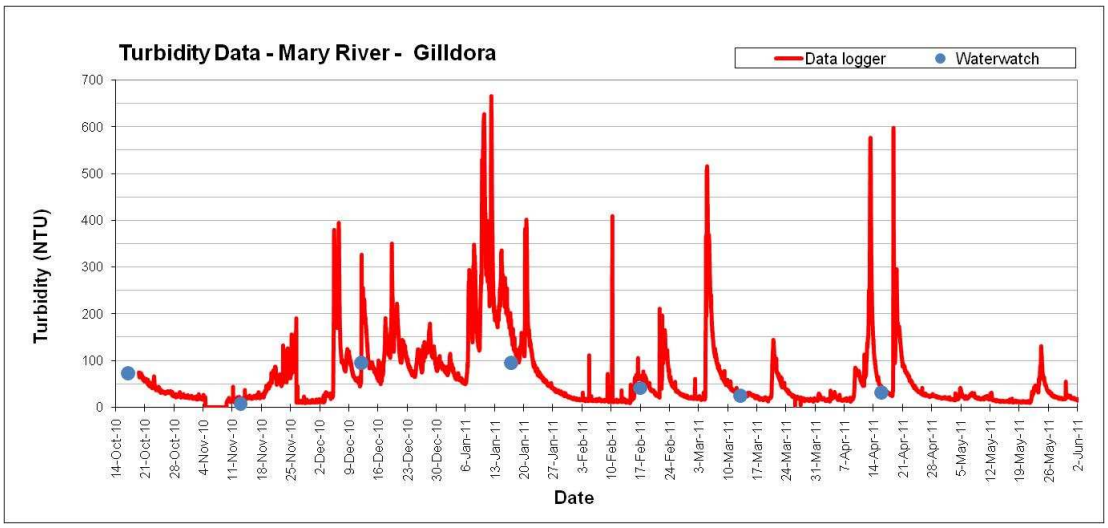


**Turbidity in the Mary River during the floods**

The graph below shows turbidity data recorded from an automated turbidity data logger installed in the Mary River upstream of Gympie (Gilldora). This clearly shows the extreme turbidity levels (more than 600 NTU's) recorded in the Mary River during the summer 2010/11 flood events. MRCCC's previous data using hand-sampling techniques has not measured any turbidity levels over 500 NTU's. The automated equipment was able to sample during the dirtiest and most dangerous part of the flood, which we would not ordinarily be able to sample safely.

To put this into perspective, a turbidity measurement of 600 NTU's combined with the peak flow rate recorded in the Mary River at Miva equates to approximately 237 tonnes of sediment (or seven dump trucks) flowing under the Dickabram bridge every minute.

The ambient turbidity sampling conducted by the volunteers cannot measure this impact on water quality because turbidity measurements are not taken during the peak flood events. The graph below shows the monthly Waterwatch turbidity measurements recorded for the year at a nearby Waterwatch site compared to the turbidity data recorded from the automated turbidity logger installed at Gilldora. This clearly shows that the Waterwatch turbidity data does not capture the peak events.




Mary River, Dobson Rd – January 2011

**Monitoring Methods**

Sites monitored by the network are visited monthly. The volunteers use a TPS WP-81 to measure the temperature, pH and electrical conductivity, a TPS WP-82 to measure dissolved oxygen and a turbidity tube to measure turbidity. Volunteers are trained to follow the techniques as outlined in the Mary River Catchment Coordinating Committee's (MRCCC) Quality Assurance Manual. The network coordinator verifies all data before being entered into the Waterwatch database. Each equipment kit is maintained and calibrated monthly by MRCCC staff with occasional shadow testing against other equipment.

Each of the sub-catchments monitored in the Mary Catchment is unique in terms of its geology, flow regime and land use. It is therefore expected that the water in a sub-catchment would have its own unique baseline levels of the various parameters measured by Waterwatch. Some differences between sub-catchments in the Mary are recognized in the Qld Water Quality Guidelines

Report Card grades are based on Waterwatch data compliance with Aquatic Ecosystems guideline values outlined in the Qld Water Quality Guidelines.

(Environmental Protection Agency, 2006 and Department of Environment and Resource Management 2009): Different guidelines are applicable to different sub-catchments of the Mary Catchment

| **Parameter** | **Gympie – Amamoor Waterwatch water quality guidelines** |
|---|---|
| pH:- | 6.5 – 8.0 |
| Electrical Conductivity (EC): - | <580 uS/cm |
| Dissolved Oxygen (DO): - | 85 – 110 % Saturation |
| Turbidity: - | < 50 NTU |
| Temperature: - | (Summer 22-30 °C, Winter 16-24°C) |

Amamoor Creek, Mary Valley Road – January 2011

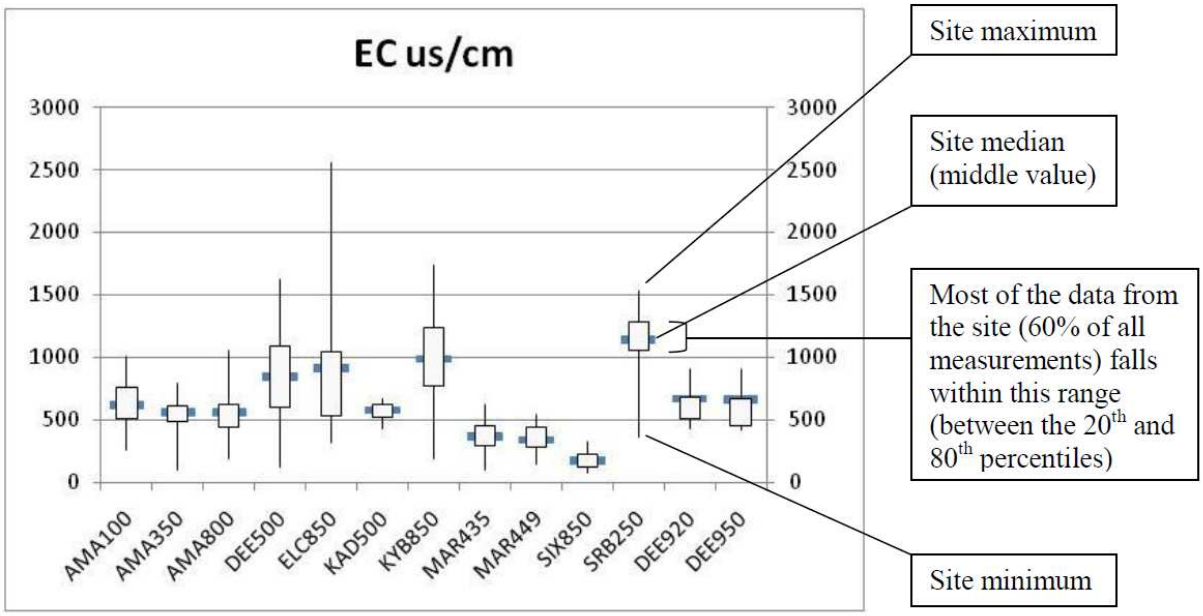
## **Results-** inter-site comparisons

Within each waterwatch network, the spread of pH, EC and dissolved oxygen values are compared across all the sites in the network. These inter-site comparisons use a modified box and whisker graph to look at the spread of values recorded for each parameter at each site.

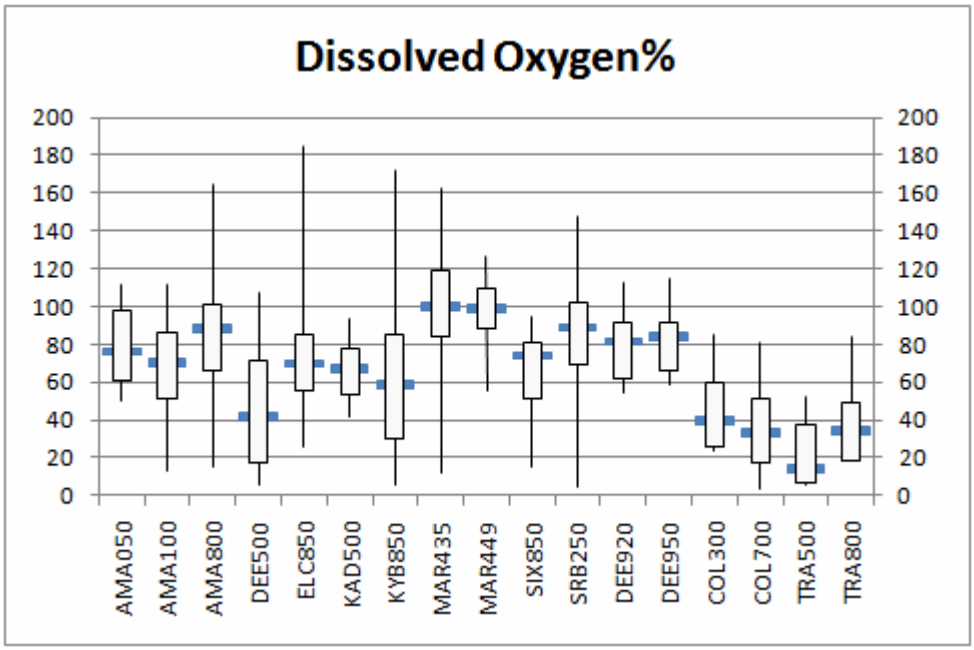
For each site on the graph:

- The vertical line (whiskers) shows the range between the maximum and minimum values recorded at the site.
- The vertical boxes show the range between the 20$^{th}$ and 80$^{th}$ percentiles at each site.
- The horizontal bars show the median value (50$^{th}$ percentile) for each site.

This comparison is useful for identifying sites that are unusually variable or have generally higher or lower values than other sites in the network.

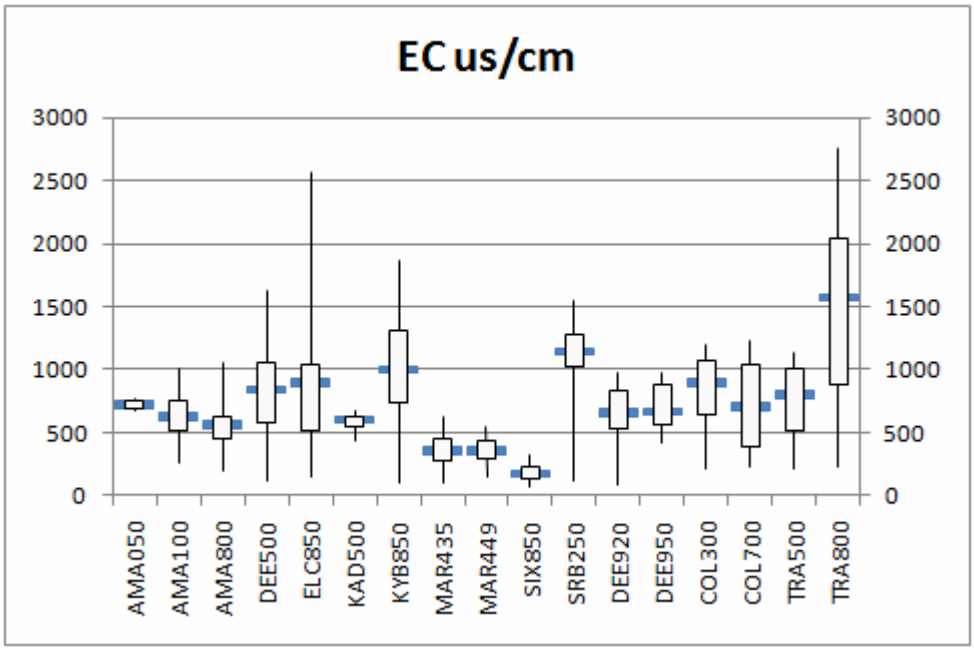


**Long-term inter-site comparison of dissolved oxygen levels (all data collected)**



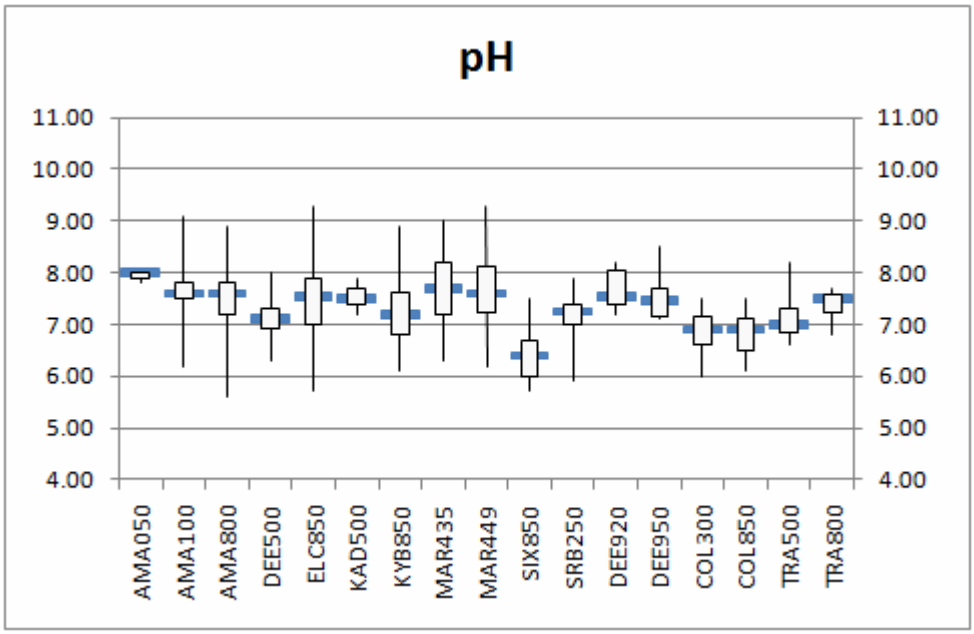

- This graph illustrates all the long-term data collected from each site, not just the last year's data.
- Dissolved oxygen levels can change remarkably over the course of a day. In disturbed systems with high nutrient and light levels dissolved oxygen can vary over a wide range eg. 30% to 150%. In more undisturbed systems the oxygen levels are generally maintained within a smaller range eg. the guidelines for the Mary Catchment are 80% to 110%.
- Mary River sites are more consistently within the water quality guidelines with less overall variation for dissolved oxygen – this is because of reasonably constant flow and mixing of water down the river.
- Of the long-term monitoring sites, Deep & Kybong Creeks have the greatest variation, combined with levels generally below the water quality guidelines for dissolved oxygen in healthy aquatic ecosystems. This could be due to a combination of low flows, high light levels and nutrient inputs.

**Long-term inter-site comparison of electrical conductivity (salinity)**




- This graph illustrates all the long-term data collected from each site, not just the last year's data.
- These graphs reflect the variation in conditions experienced at these sites over the time the data has been collected. Some of these sites have a long history of data, including a long period of drought and low flows. More recent data does not include these long drought periods, eg. the Kandanga Creek site (KAD500) has only had data collected during relatively good seasons.
- Mary River and Six Mile Creek have consistently complied with guidelines - lowest EC values
- The more intermittently flowing creeks such as Scrubby, Kybong, Eel, Coles, Traveston and Deep Creeks have generally higher EC values, and larger variation. Traveston Creek (TRA800) has the highest EC level and shows exceptional variation in electrical conductivity.

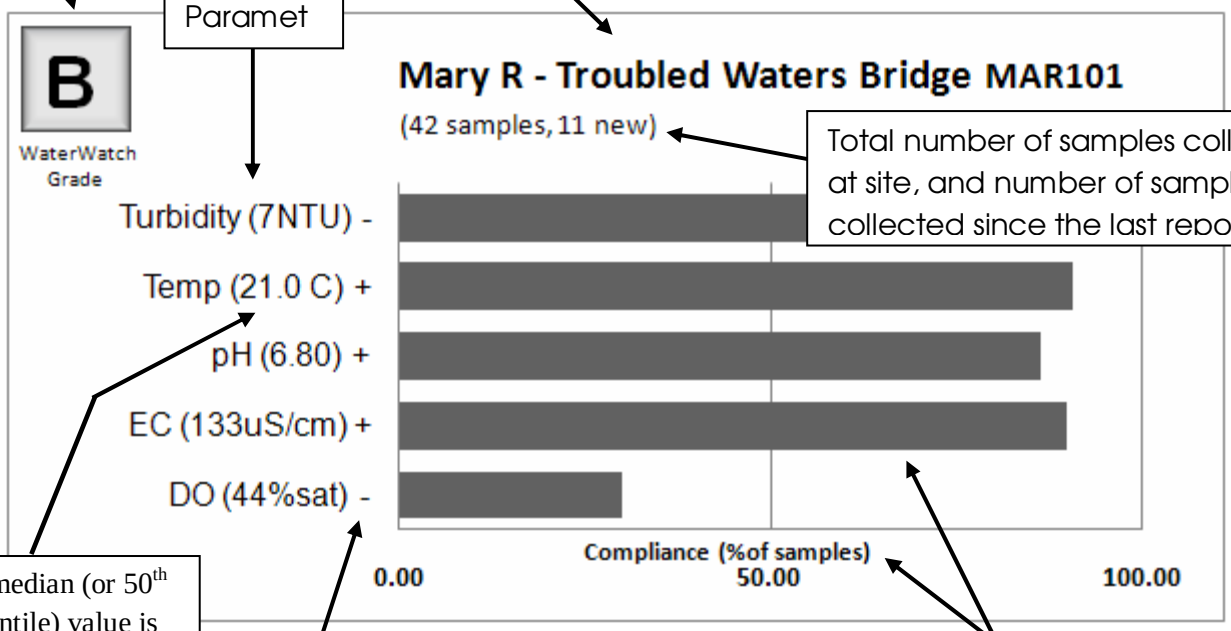
**Long term inter-site comparison of acidity**




- This graph illustrates all the long-term data collected from each site, not just the last year's data.
- All sites show generally good compliance with pH.
- Six Mile Creek has displayed low pH (acidic) levels, which is consistent with the nature of the sub-catchment. Coles Creek is a displaying a similar trend, although the dataset is much smaller.
- The Mary River sites show overall high pH levels with more variation than the creek sites. This may be due to algal activity within the large pools with high light penetration.
- With the exception of Six Mile and Coles Creeks, the majority of the data from the sites is above pH 7.

**Results** - site report cards

The long-term data from each site is analysed and presented as a graphical report card. These graphs present the long-term median value of each parameter and the level of compliance with the relevant guidelines across all the individual samples from that site. The illustration and descriptions below show where this information can be found on the report cards and how to interpret the graphs.

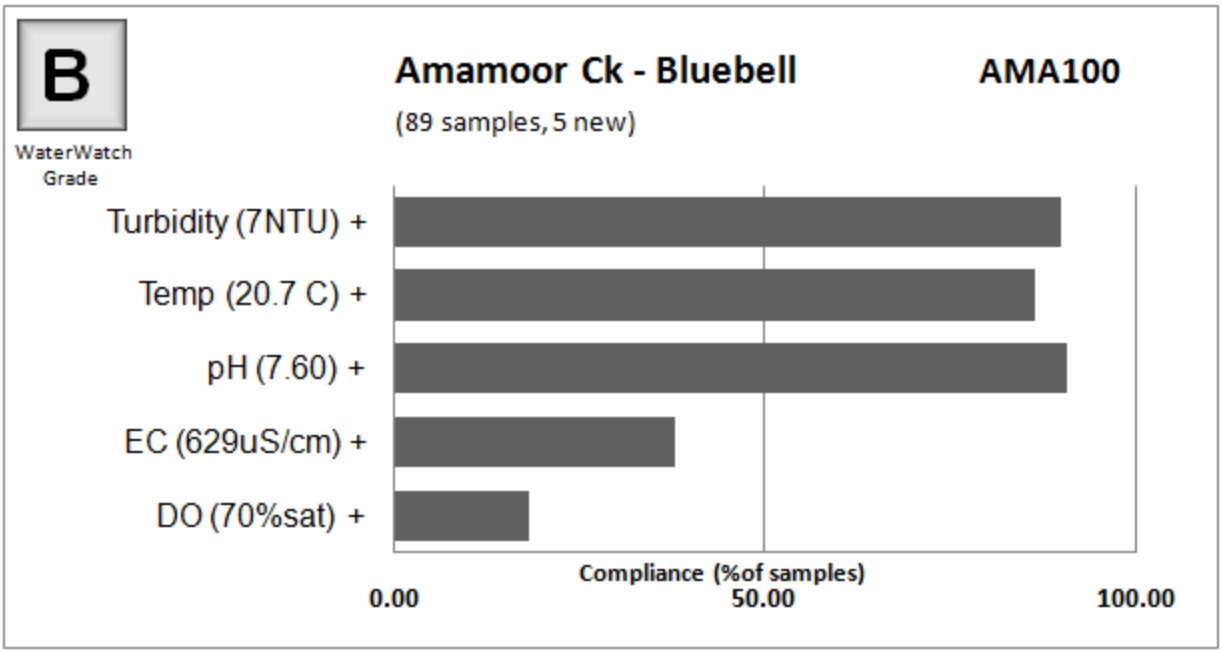



The median (or 50th percentile) value is shown in brackets after each of the parameter names. This is considered the value most representative for the parameter at this site.

+ or – symbol for each parameter to represent trend in water quality data over the past 12 months. + symbol indicates water quality has improved or stayed the same, - symbol indicates water quality has degraded, during the last 12 months monitoring.

Percent compliance of data collected for each parameter at the site i.e. the percent of times the parameter was within the accepted WQO guidelines. 0% means the parameter was never within the guidelines, 50% means the parameter met the guidelines half of the time and 100% would mean the parameter always met the guideline value.

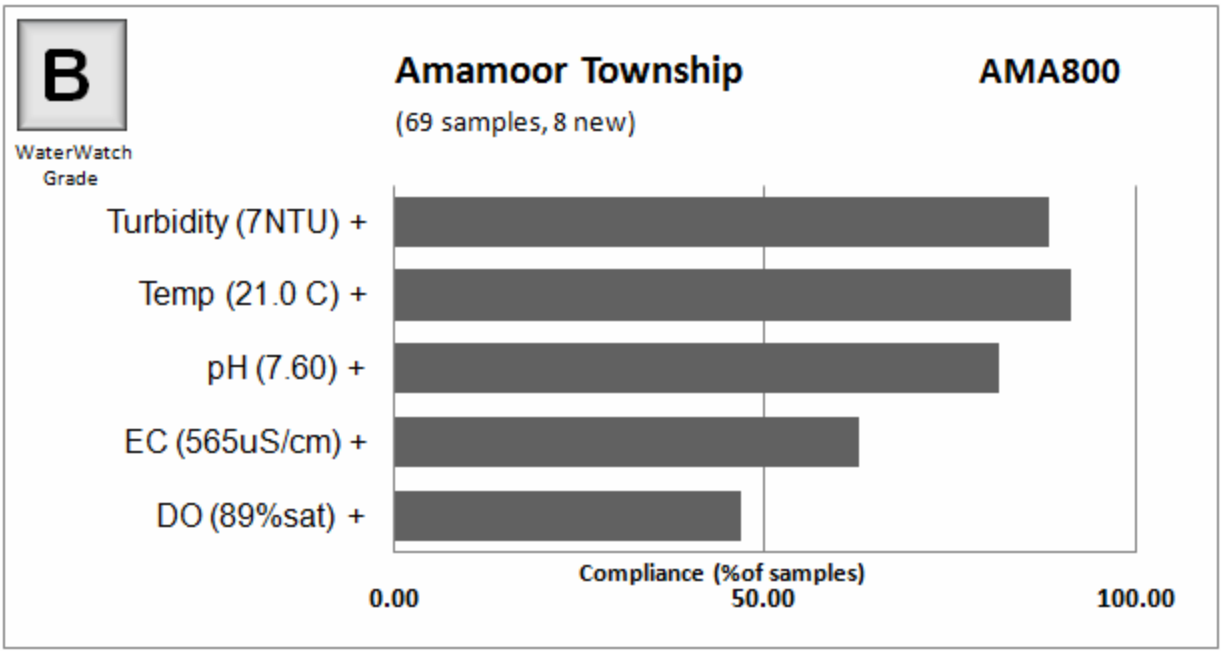
### Amamoor Creek




- Good sample size
- Consistently higher EC levels than other sub-catchments in the network – which is consistent with the nature of the sub-catchment
- This year's data shows an improving trend on all 5 phys-chemical water quality parameters for all sites tested in Amamoor Creek
- Consistent improvement in dissolved oxygen compliance over the last 3 years

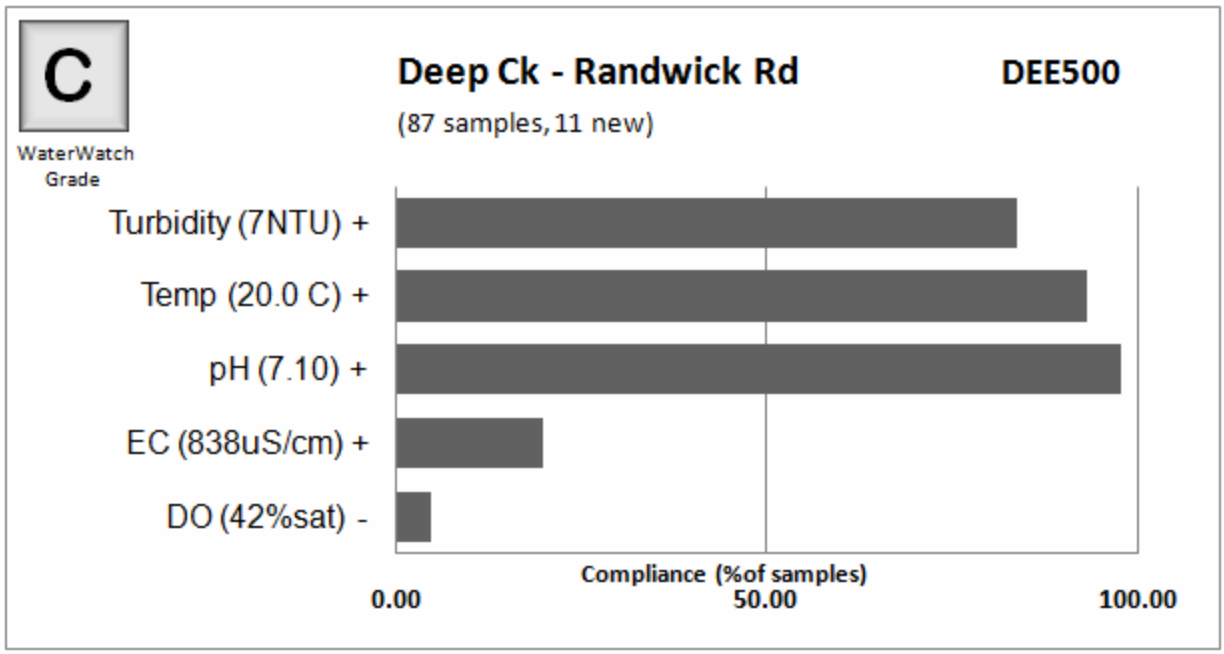
### AMA050, Amamoor Creek, Bluebell

- Not enough ambient data to generate a report card, but shows similar trends to that of AMA100, including higher EC levels.

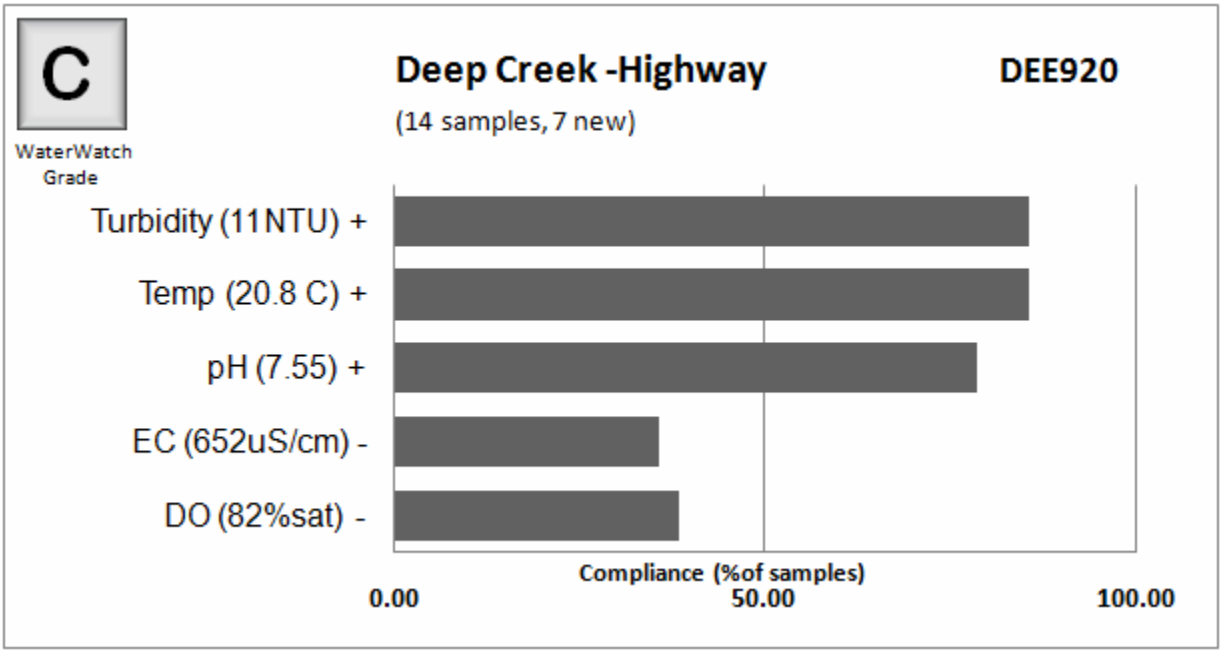



- Good sample size
- Better EC and dissolved oxygen compliance than Amamoor Creek, Bluebell – most likely due to more reliable flows because the site is located lower in the sub-catchment

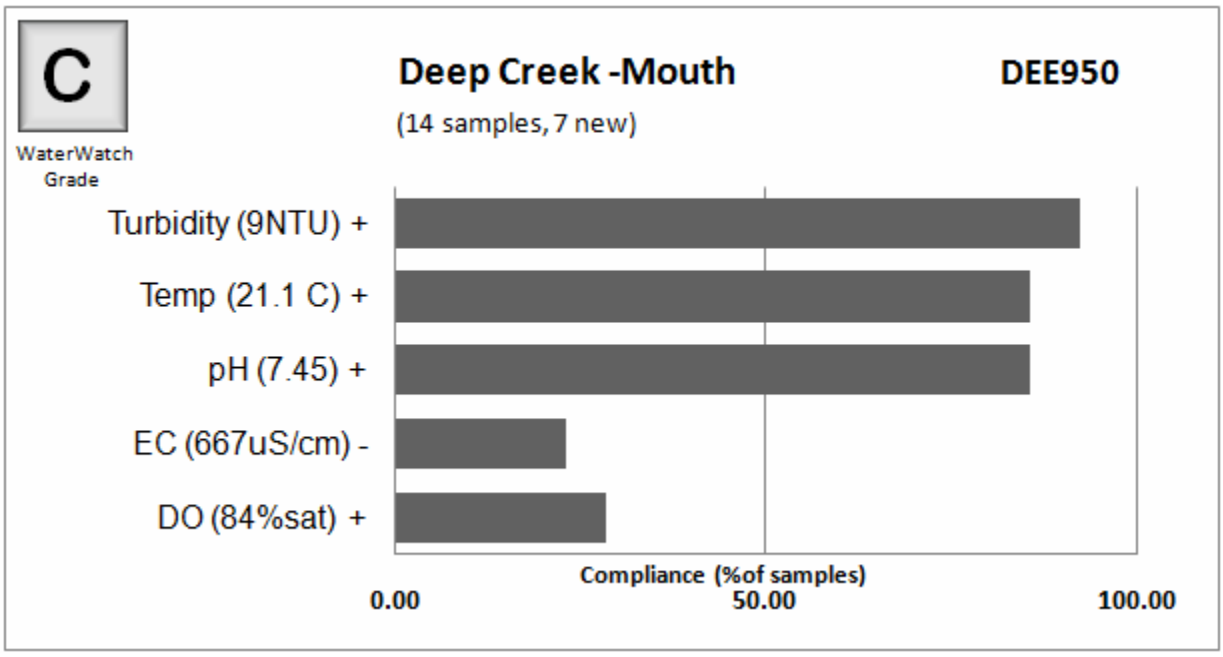
**Deep Creek**




- Good sample size
- Consistently higher EC levels than other sub-catchments
- Low compliance with guidelines for dissolved oxygen, with a declining trend over the past 3 years.

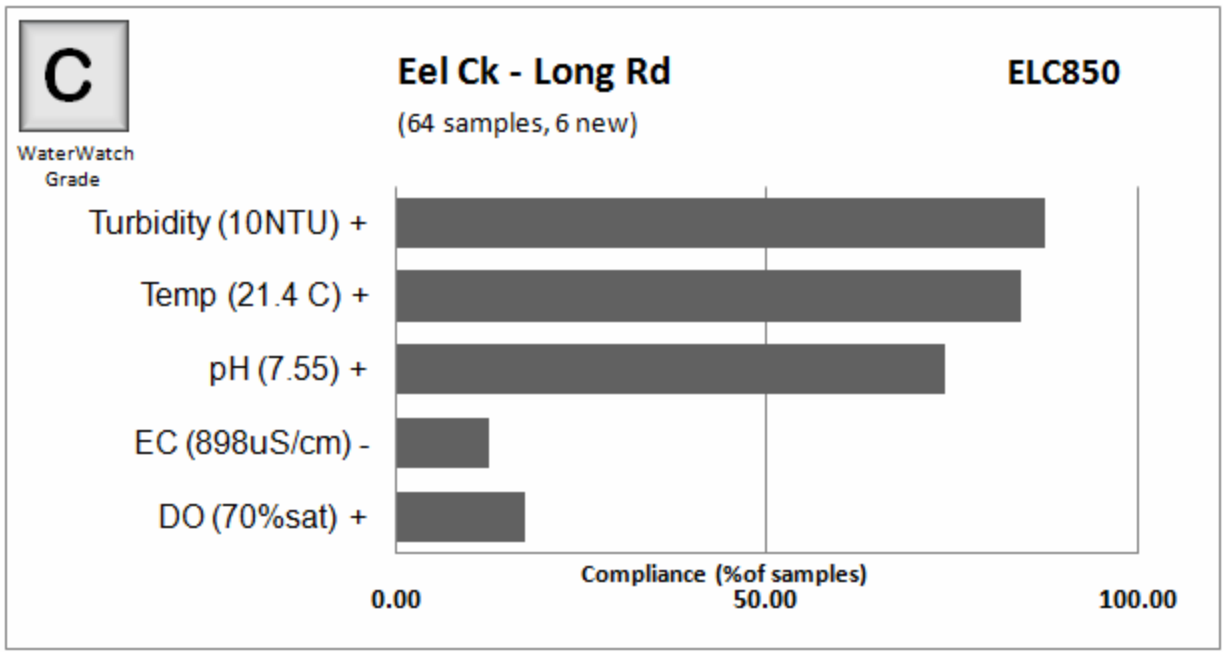



- Sample size is not yet sufficient to make definitive comments on trends.
- Better EC compliance than upstream sample site on Randwick Rd, Deep Creek, due to the influence from the Mary River.
- Improved dissolved oxygen compliance than upstream sample site on Randwick Rd
- Temperature higher than Randwick Road, Deep Creek, possibly due to a general lack of riparian shading for a considerable length upstream through the Fossicking Area.



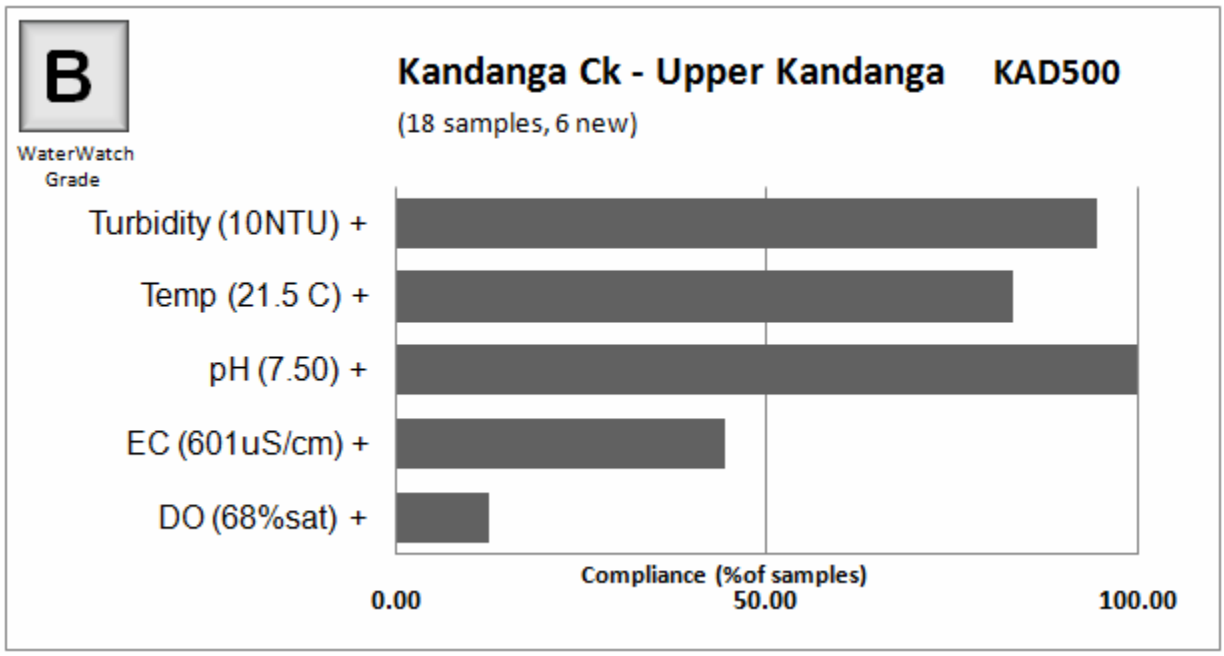

- Sample size is not yet sufficient to make definitive comments on trends.
- Very little different between this site and DEE920

**Eel Creek**



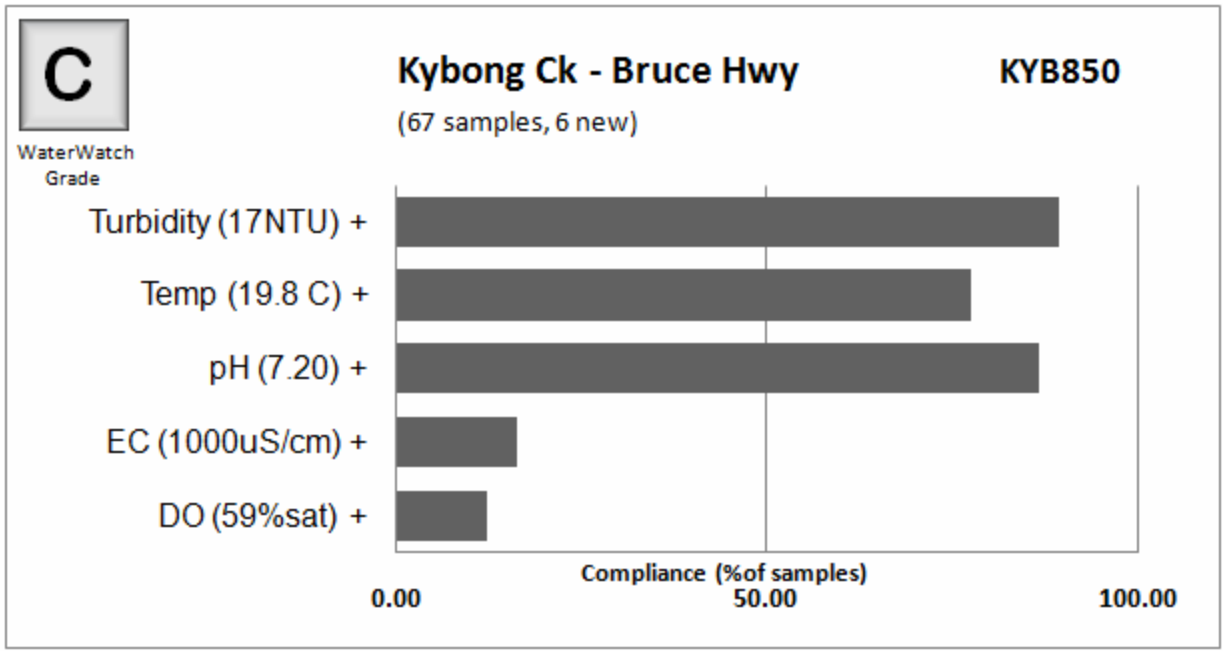

- Good sample size
- Consistently higher EC levels than other sub-catchments
- Improvement in dissolved oxygen compliance over the past year, compared to a declining trend in previous years

**Kandanga Creek**



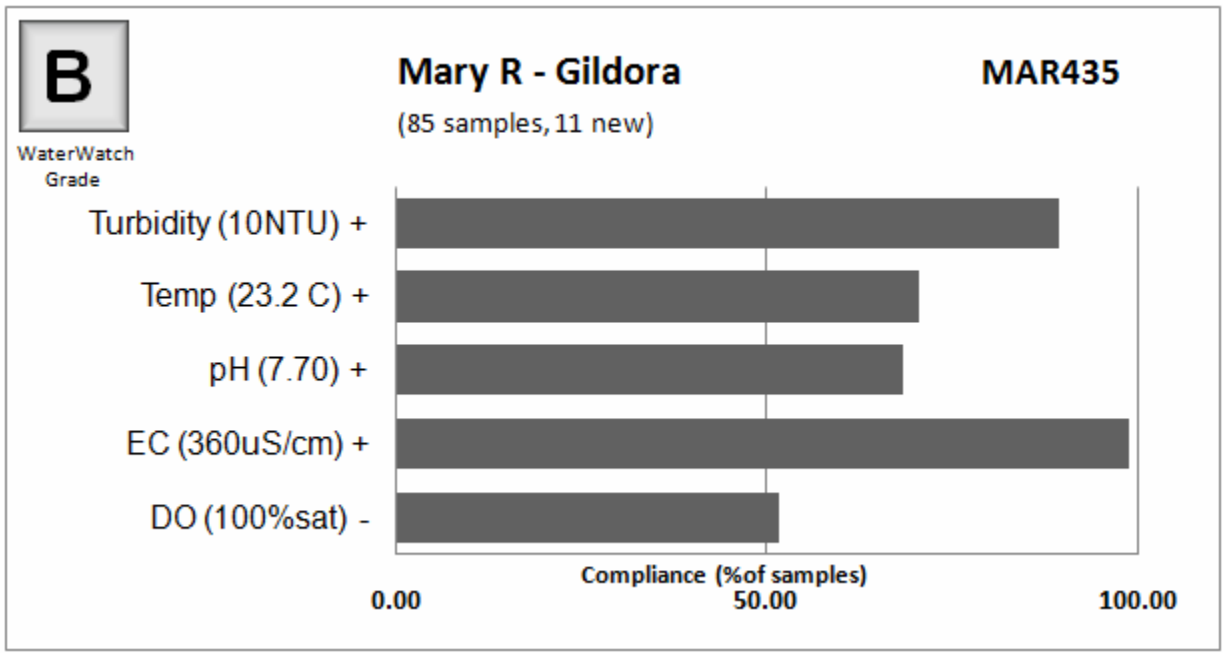

- Sample size is too small to make a firm comment on trends
- This year's data indicates a general improvement on all 5 phys-chemical water quality parameters

**Kybong Creek**

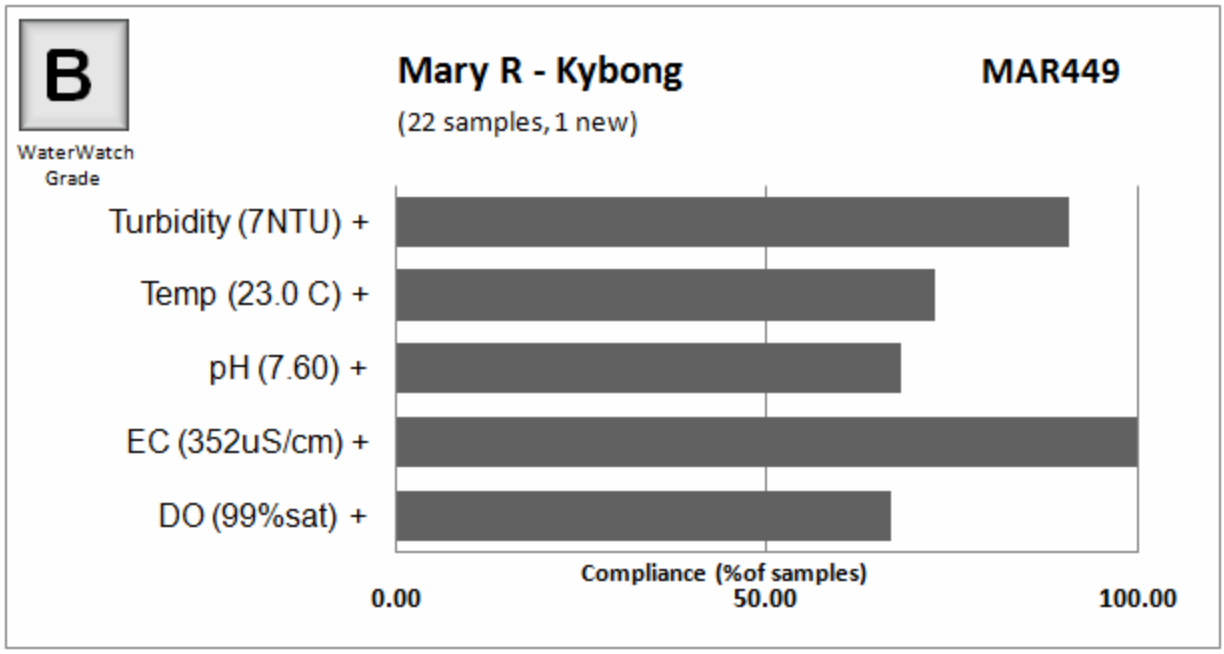



- Good sample size
- This year's data indicates a general improvement on all 5 phys-chemical water quality parameters
- Consistently higher EC levels than other sub-catchments

**Mary River**

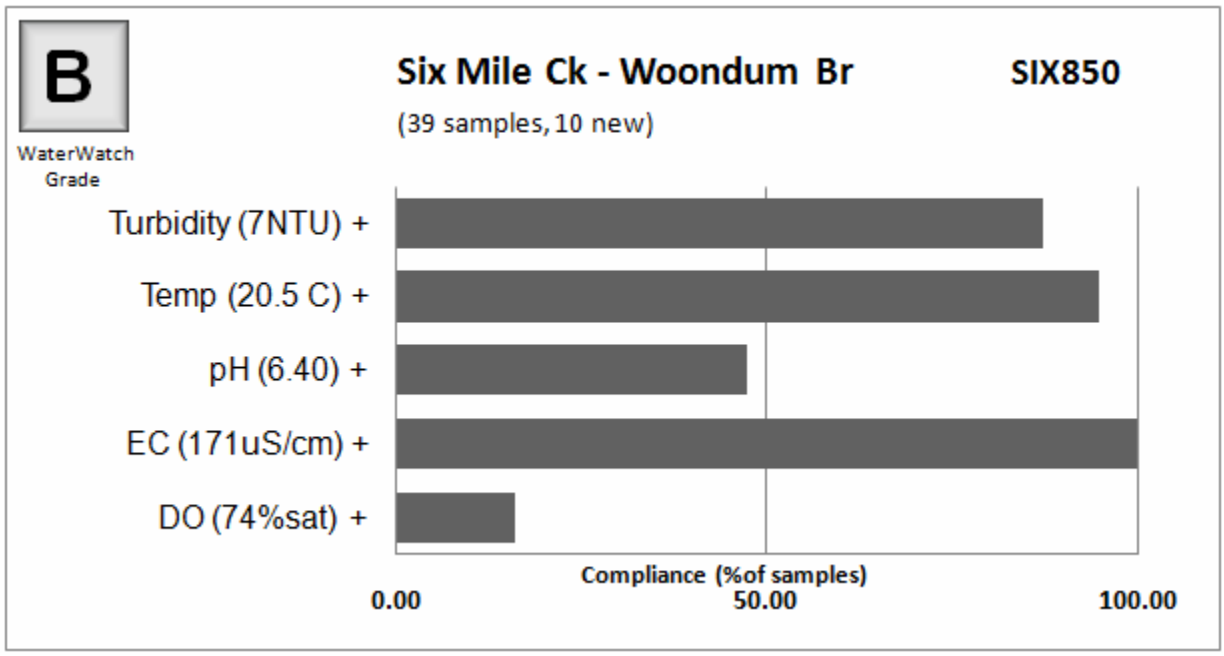



- Good sample size
- Good EC compliance – correlated with regular flows
- Mary River sites have considerably higher water temperature levels and oxygen levels than the sample sites located on creeks, due to less riparian vegetation shading the water



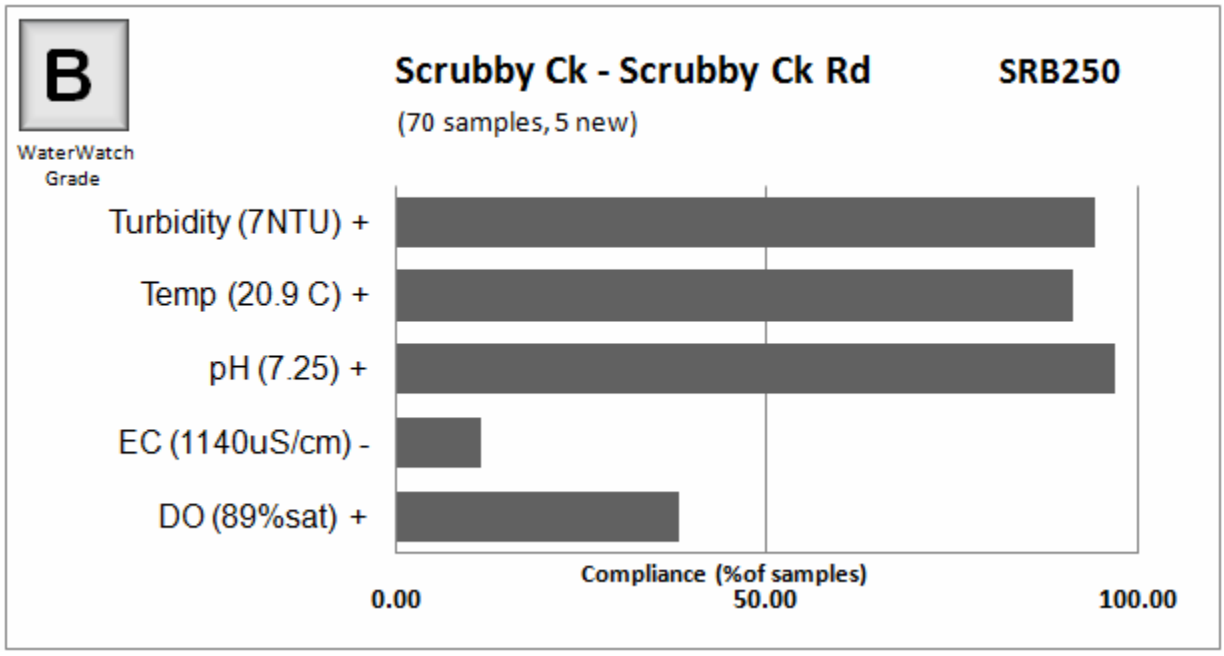

- Good EC compliance – correlated with regular flows

**Six Mile Creek**



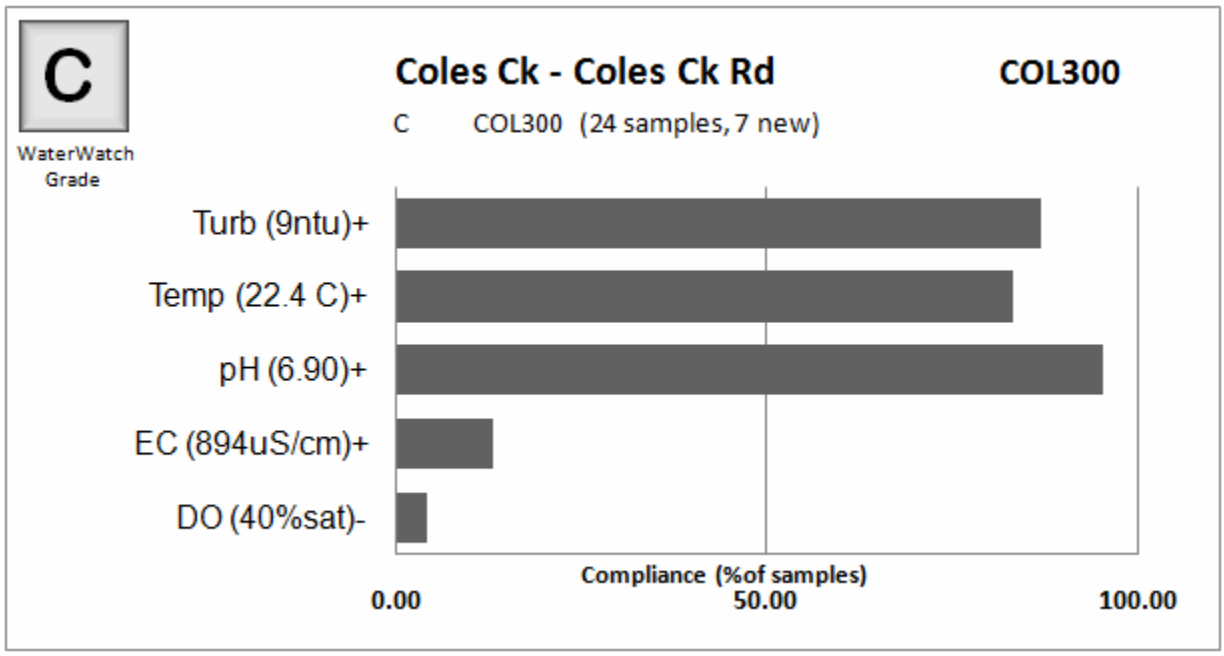

- Naturally acidic sub-catchment
- Good EC compliance – lowest EC level of all sub-catchments sampled in Waterwatch network
- The low level of compliance for dissolved oxygen, compared to the guideline values, may not be reflective of poor stream health, as the aquatic ecosystem is quite healthy in Six Mile Creek.

**Scrubby Creek**

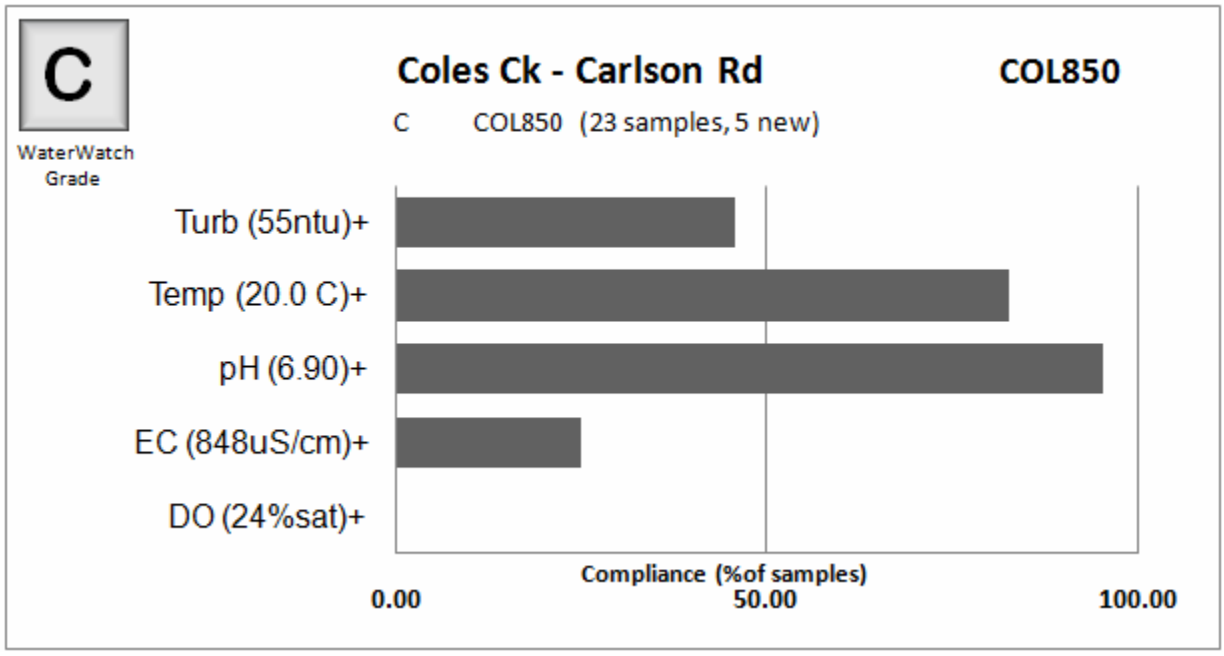



- Good sample size
- Low EC compliance – 2nd highest median EC level recorded for this Waterwatch network
- Low compliance for dissolved oxygen is due to high variation

**Coles Creek**

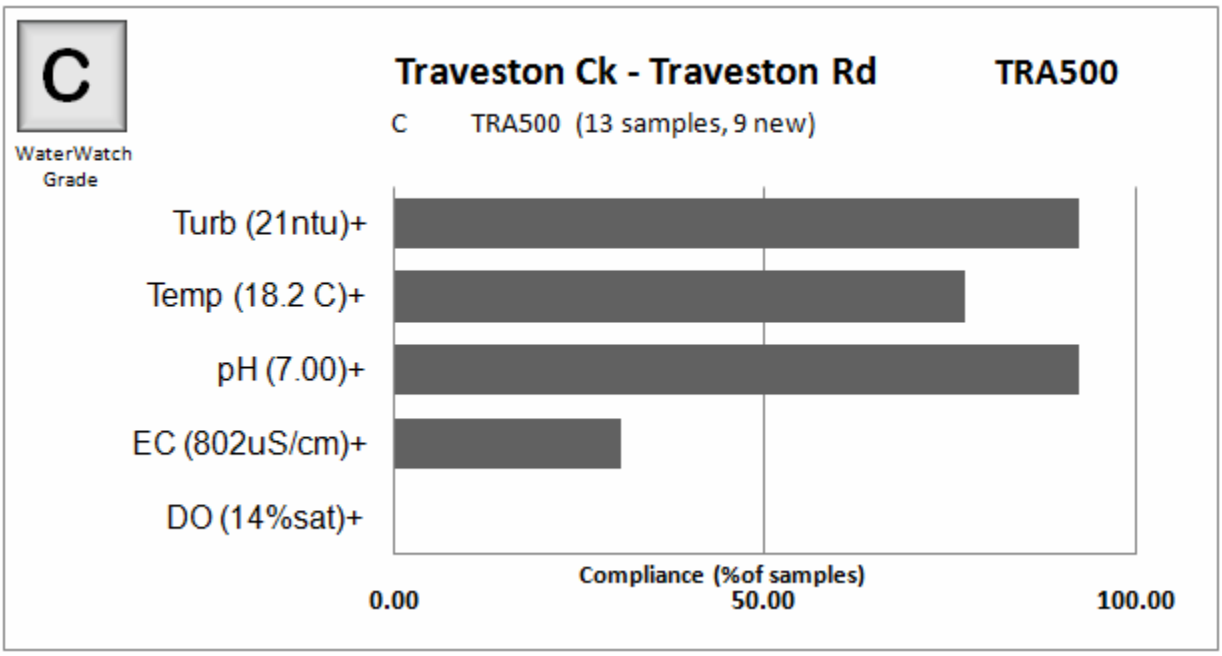



- At the Coles Creek sites the low compliance with dissolved oxygen guidelines is due to very low overall levels of dissolved oxygen during the period sampled. Generally Coles Creek has low to nil flows coupled with high leaf litter inputs from the shaded riparian zone.
- At the Coles Creek (COL300) site EC is consistently above the guideline level

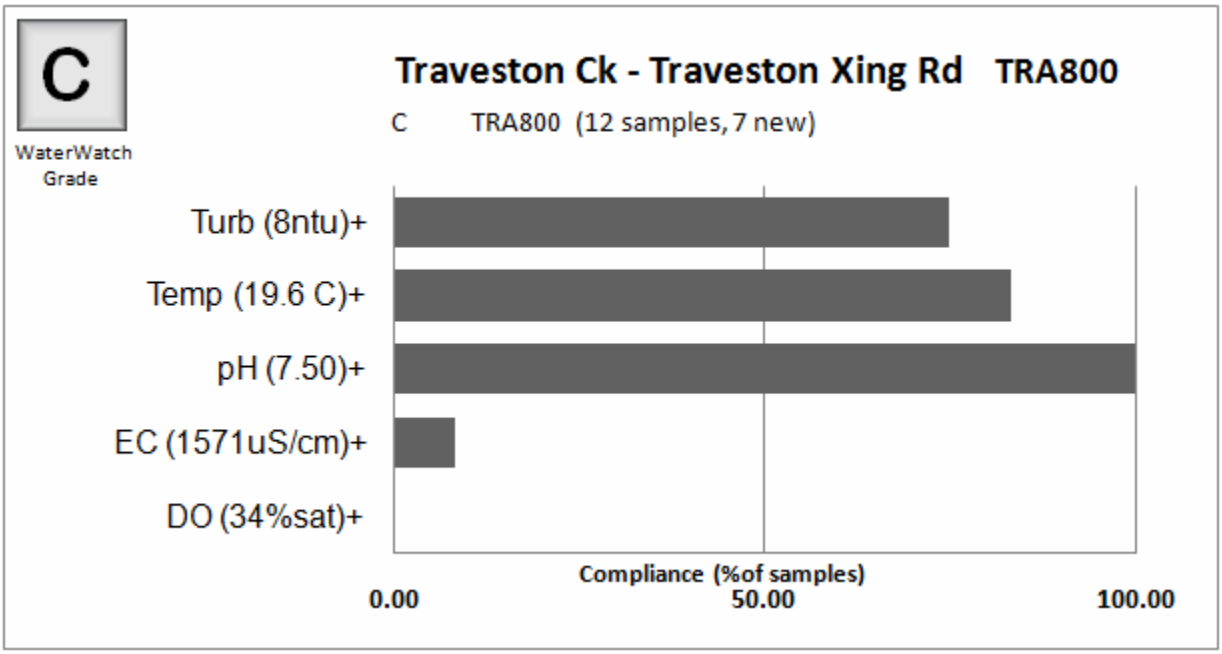



- Low compliance with dissolved oxygen guidelines is due to very low overall levels of dissolved oxygen during the period sampled.
- Good temperature regulation possibly from riparian shade cover

**Traveston Creek**




- At the Traveston Creek sites the low compliance with dissolved oxygen guidelines is due to very low overall levels of dissolved oxygen during the period sampled. Generally Traveston Creek has low to nil flows coupled with high leaf litter inputs from the shaded riparian zone.
- Good temperature regulation due to riparian zone shading




- Nil compliance with dissolved oxygen guidelines is due to very low overall levels of dissolved oxygen during the period sampled.
- A localised high EC level has been detected in this vicinity, with the cause as yet unknown – highest median EC level recorded in this network.

*This report prepared with the assistance of the Gympie Regional Council Environment Levy*

# Appendix

**Data Analysis**

The MRCCC Waterwatch Report Card assessment is based on all data collected for each site. Using the Waterwatch data, we have developed a report card grade from an A to F for each of the Waterwatch sites. The report card grade is derived from the physical and chemical parameters monitored by the Waterwatch volunteers and is not a grade that represents the holistic health of the site or stream. To obtain a more overall rating of health we would need to collect data on other processes such as macroinvertebrates, nutrients, fish species, riparian zone health, etc. This is a future goal of the MRCCC. However the MRCCC Waterwatch Report Card Grade provides us with an excellent general rating of the physical/chemical water quality of our sites.

The Report Card grade for each site is determined by comparing the Waterwatch data results to the QLD Water Quality Objectives (WQO's) developed by the Environmental Protection Agency. For the parameters pH, DO, EC and turbidity, the number of times the parameters complied with the WQO's was calculated. This was then converted to a percentage to give a "percent compliance" figure for each parameter at each site. For example if 100 pH samples were taken, and 85 of them were within the accepted limits of the WQO guidelines, the site would score 85 percent compliance for pH. For temperature, a percent compliance was calculated by comparing the results with data from an Upper Obi Obi Creek reference site, taking into account the season (i.e. higher expected temperatures in summer than in winter).

A weighted average of percent compliance of the 5 measured parameters was then taken. DO was only given a half weighting due to the variable nature of spot DO measurements. Turbidity was also given a half weighting, as it is more informative if regular records are collected throughout high flow events. This average was then classed as an A, B, C or F based on the following:

**A** – Greater than 80 percent compliance. The water quality at this site is within the accepted WQO guidelines more than 80% of the time, and is considered to have **excellent water quality** compared to a reference site in excellent condition.

**B** – Between 66 and 80 percent compliance. The water quality at this site is within the accepted WQO guidelines more than two thirds of the time, and is considered to have **good water quality** compared to a reference site in excellent condition.

**C** – Between 50 and 66 percent compliance. The water quality at this site was within accepted WQO guidelines more than half of the time, and is considered to have **average water quality** compared to a reference site in excellent condition.

**F** – Less than 50 percent compliance. The water quality at this site was *below* the accepted WQO guidelines more than half of the time, and is considered to have **poor water quality** compared to a reference site in excellent condition.

MARY RIVER CATCHMENT COORDINATING COMMITTEE

**January 2011 flood heights**

| Gauging Station | 2011 Peak Flow | 2011 Peak Height | Ranking of 2011 flood |
|---|---|---|---|
| Bellbird – Mary River (Conondale) | 211 534 meg/day | 8.989m | 4th highest since 1959<br><br>Peak – 1989 – 11.0m<br>329 097 meg/day |
| Moy Pocket – Mary River (Kenilworth) | 247 798 meg/day | 15.748m | 3rd highest since 1963<br><br>Peak – 1999 – 16.87m<br>312 336 meg/day |
| Miva - Mary River | 536 554 meg/day | 19.46m | 5th highest since 1910<br><br>Peak – 1974 – 20.8m<br>641 606 meg/day |
| Tiaro – Mary River (Home Pk) | 524 729 meg/day | 18.728m | 3rd highest since 1982<br><br>Peak – 1992 – 20.61m<br>730 166 meg/day |
| Kilkivan – Wide Bay Ck | 79 920 + meg/day<br><br>(discharge larger than recorded) | 8.20m<br><br>(overtopped 8.2m gauge by 0.5m) | Highest since 1974<br><br>Previous peak – 1989 @<br>74 563 meg/day (7.86m) |
| Woolooga – Wide Bay Ck | 194 793 meg/day | 12.937m | Highest since 1909<br><br>Previous peak - 1947 @<br>126 835 meg/day |
| Munna Creek | 111 451 meg/day | 11.992m | 10th highest since 1923<br><br>Peak – 1955 – 16.24m<br>274 492 meg/day |
| Kandanga Ck – Hygait | 66 198 meg/day | 7.263m | |
| Glastonbury Creek | 47 462 meg/day | 6.766m | |
| Amamoor Creek | 54 432 meg/day | 8.658m | |
| Six Mile Ck – Cooran | 29 808 meg/day | 10.318m | |
| Obi Obi Ck – Maleny | 18 775 meg/day | 2.006m | |
| Tinana Ck - Goomboorian | 13 137 meg/day | 6.441m | |

*Flood height information prepared by MRCCC February 2011*