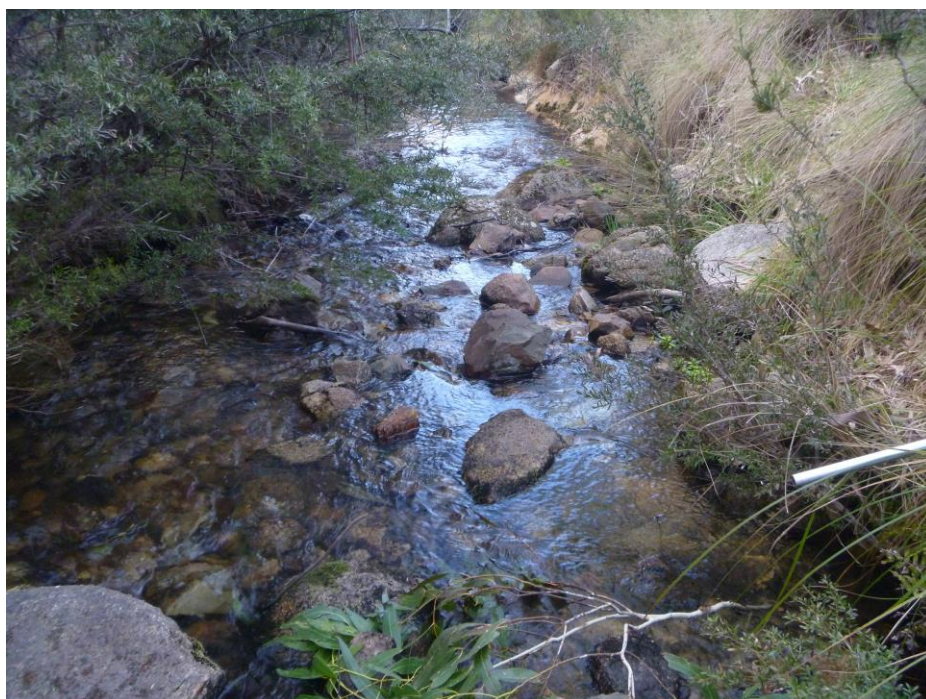


BIOLOGICAL RESPONSE TO FLOWS DOWNSTREAM OF CORIN, BENDORA, COTTER AND GOOGONG DAMS

Spring 2017

Summary report to Icon Water



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EXECUTIVE SUMMARY

SPRING 2017 RESULTS AND CONCLUSIONS

- Discharge across the region in the 6 months prior to sampling was far less in spring 2017 than spring 2016, largely due to below average rainfall during this period in 2017.
- Water quality parameters at below dam test sites and reference sites were within guideline levels in spring 2017, with the exception of nitrogen oxides (NO_x) and total nitrogen (TN) which were above guideline levels at three of the five test sites (CM1, QM2 and QM3). pH levels were also above guideline levels at two of the reference sites.
- Test sites CM3 and QM2 did not meet the environmental flow ecological objective of <20% cover of filamentous algae in riffle habitats. It is likely that low discharge associated with low inflows resulted in lack of flow disturbance and increase in filamentous algae growth.
- All test sites were assessed as AUSRIVAS band B in spring 2017 and did not meet the environmental flow ecological objective of AUSRIVAS band A. Test sites CM1, CM2 and QM2 did not change in condition since the Autumn 2017 assessment. Test site CM3 decreased in condition from a Band A in autumn 2017 to a band B in spring 2017. Test site QM3 increased in condition from band C in autumn 2017 to band B in spring 2017.

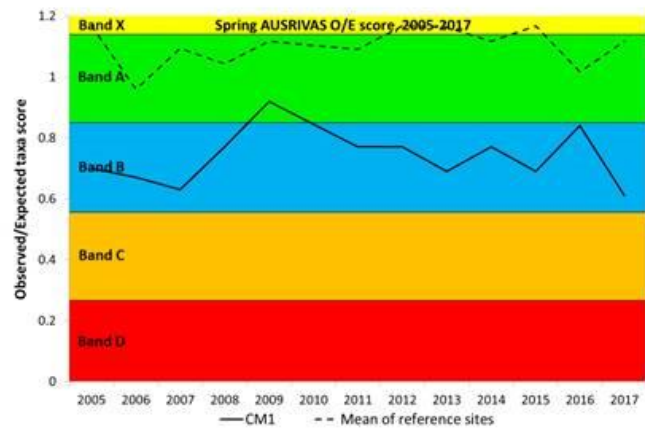
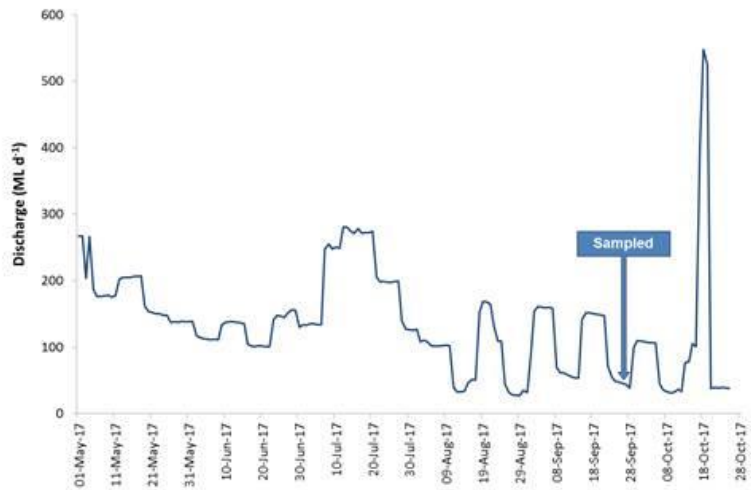
Filamentous algae cover and AUSRIVAS band scores for the test sites (green shading indicates environmental flow objective met, orange shading indicates environmental flow objective not met).

| Site | Riffle filamentous algae cover (%) | AUSRIVAS band (O/E score) |
|-------------------|------------------------------------|---------------------------|
| CM1 (Corin Dam) | < 20 | B |
| CM2 (Bendora Dam) | < 10 | B |
| CM3 (Cotter Dam) | >20 | B |
| QM2 (Googong Dam) | >20 | B |
| QM3 (Googong Dam) | < 20 | B |

CM1 – Spring 2017

Downstream of Corin Dam

| Environmental flow ecological objective | Autumn 2017 | Spring 2017 | Objective met? |
|------------------------------------------------|-------------|-------------|----------------|
| AUSRIVAS band A | Band B | Band B | No |
| <20% filamentous algae cover in riffle habitat | <20% | <20% | Yes |



* Denotes values outside guideline levels



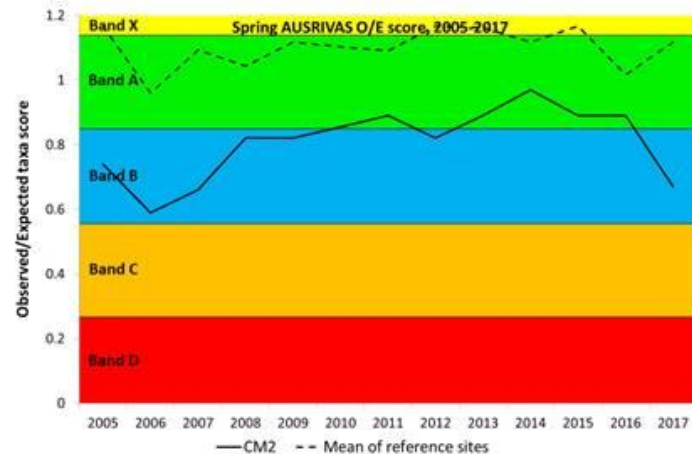
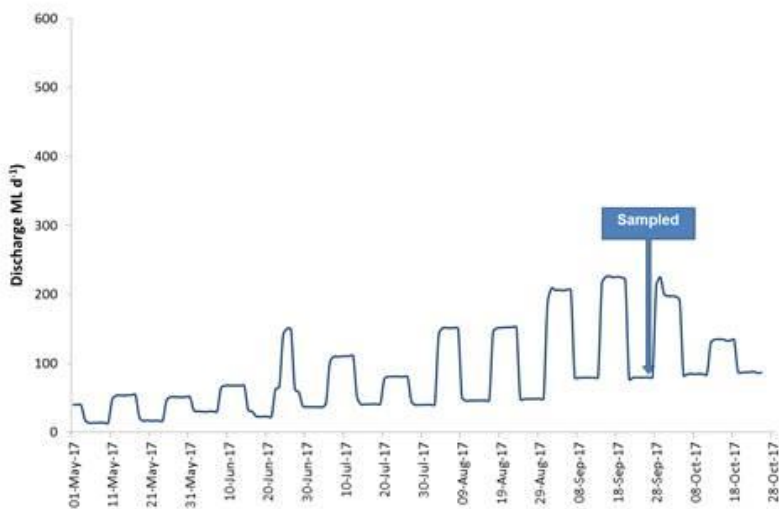
| Temp. (°C) | EC (µs cm ⁻²) | pH | D.O. (mg l ⁻¹) | Turbidity (NTU) | Alkalinity (mg l ⁻¹) | NH ₄ ⁺ (mg L ⁻¹) | NOx (mg L ⁻¹) | TN (mg L ⁻¹) | TP (mg L ⁻¹) |
|------------|---------------------------|------|----------------------------|-----------------|----------------------------------|----------------------------------------------------|---------------------------|--------------------------|--------------------------|
| 9.61 | 27 | 7.06 | 9.64 | 0 | 6 | <0.002 | 0.019 | 0.12 | 0.007 |



CM2 – Spring 2017

Downstream of Bendora Dam

| Environmental flow ecological objective | Autumn 2017 | Spring 2017 | Objective met? |
|------------------------------------------------|-------------|-------------|----------------|
| AUSRIVAS band A | Band B | Band B | No |
| <20% filamentous algae cover in riffle habitat | <10% | <20% | Yes |



* Denotes values outside guideline levels



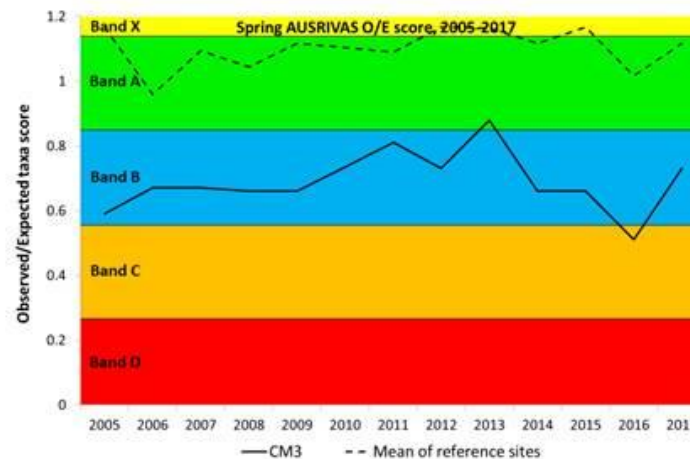
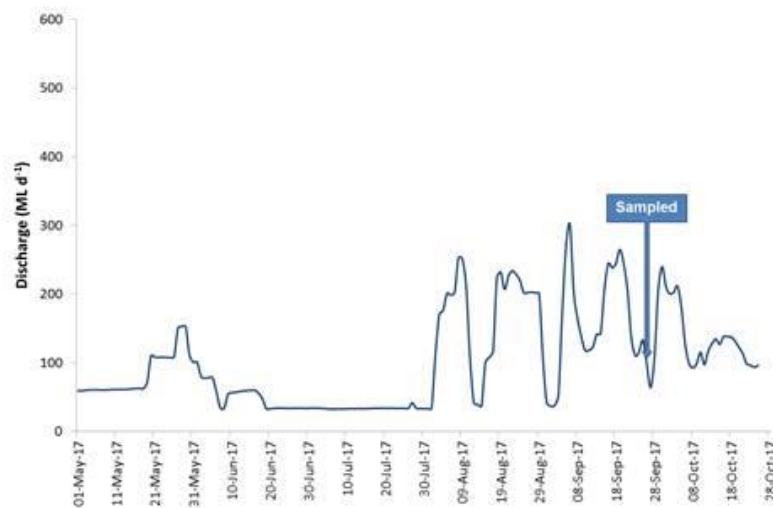
| Temp. (°C) | EC (µs cm⁻²) | pH | D.O. (mg l⁻¹) | Turbidity (NTU) | Alkalinity (mg l⁻¹) | NH₄⁺ (mg l⁻¹) | NOx (mg l⁻¹) | TN (mg l⁻¹) | TP (mg l⁻¹) |
|------------|--------------|------|---------------|-----------------|---------------------|---------------|--------------|-------------|-------------|
| 8.24 | 26 | 7.37 | 10.65 | 0.0 | 10 | <0.002 | 0.005 | 0.1 | 0.006 |



CM3 – Spring 2017

Downstream of Cotter Dam

| Environmental flow ecological objective | Autumn 2017 | Spring 2017 | Objective met? |
|------------------------------------------------|-------------|-------------|----------------|
| AUSRIVAS band A | Band A | Band B | No |
| <20% filamentous algae cover in riffle habitat | <10% | >20% | No |



* Denotes values outside guideline levels



| Temp. (°C) | EC (µs cm ⁻²) | pH | D.O. (mg L ⁻¹) | Turbidity (NTU) | Alkalinity (mg L ⁻¹) | NH ₄ ⁺ (mg L ⁻¹) | NO _x (mg L ⁻¹) | TN (mg L ⁻¹) | TP (mg L ⁻¹) |
|------------|---------------------------|------|----------------------------|-----------------|----------------------------------|----------------------------------------------------|---------------------------------------|--------------------------|--------------------------|
| 13.02 | 45 | 7.96 | 10.11 | 0.0 | 14 | <0.002 | 0.014 | 0.14 | 0.007 |

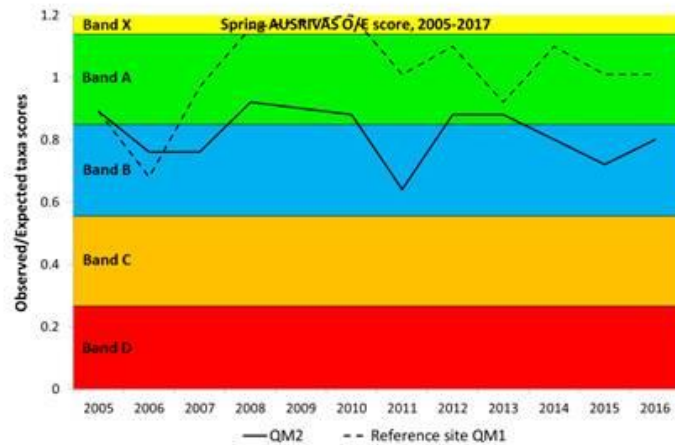
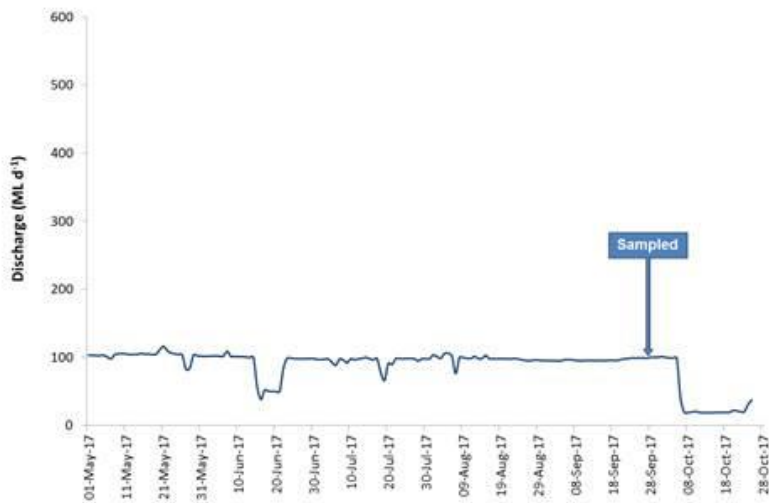


QM2 – Spring 2017

Downstream of Googong Dam



| Environmental flow ecological objective | Autumn 2017 | Spring 2017 | Objective met? |
|------------------------------------------------|-------------|-------------|----------------|
| AUSRIVAS band A | Band B | Band B | No |
| <20% filamentous algae cover in riffle habitat | <20% | >20% | No |



* Denotes values outside guideline levels



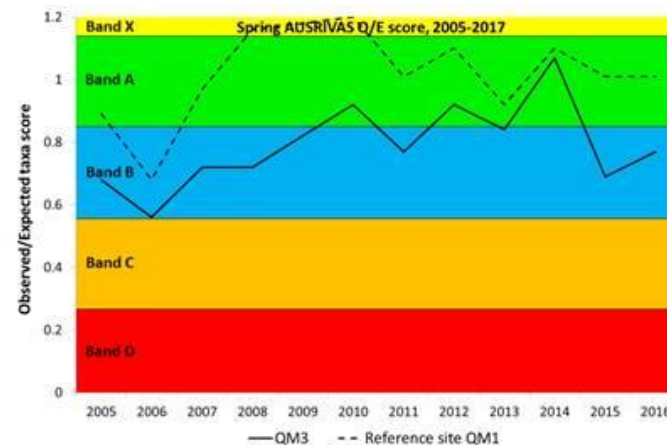
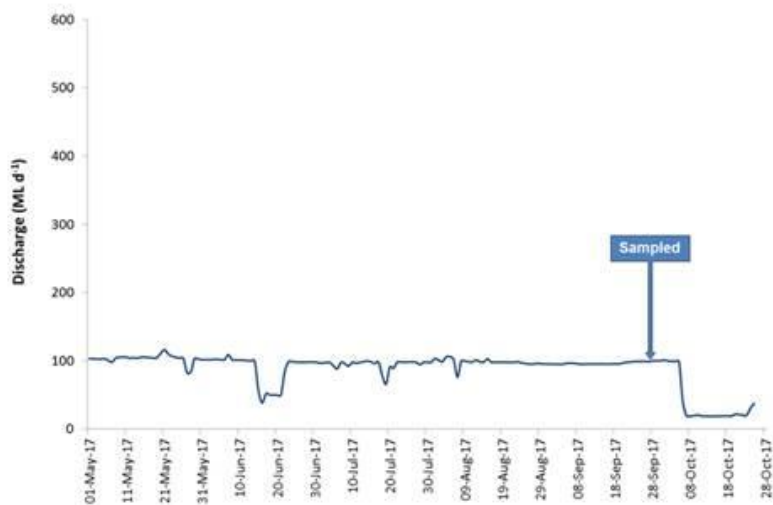
| Temp. (°C) | EC (µs cm⁻²) | pH | D.O. (mg l⁻¹) | Turbidity (NTU) | Alkalinity (mg l⁻¹) | NH₄⁺(mg L⁻¹) | NOx (mg L⁻¹) | TN (mg L⁻¹) | TP (mg L⁻¹) |
|------------|--------------|------|---------------|-----------------|---------------------|--------------|--------------|-------------|-------------|
| 11.5 | 111 | 8.06 | 10.52 | 0.0 | 35 | 0.002 | 0.031 | 0.41 | 0.01 |



QM3 – Spring 2017

2km Downstream of Googong Dam

| Environmental flow ecological objective | Autumn 2017 | Spring 2017 | Objective met? |
|------------------------------------------------|-------------|-------------|----------------|
| AUSRIVAS band A | Band C | Band B | No |
| <20% filamentous algae cover in riffle habitat | <10% | <20% | Yes |



* Denotes values outside guideline levels



| Temp. (°C) | EC (µs cm ⁻²) | pH | D.O. (mg l ⁻¹) | Turbidity (NTU) | Alkalinity (mg l ⁻¹) | NH ₄ ⁺ (mg l ⁻¹) | NOx (mg l ⁻¹) | TN (mg l ⁻¹) | TP (mg l ⁻¹) |
|------------|---------------------------|------|----------------------------|-----------------|----------------------------------|----------------------------------------------------|---------------------------|--------------------------|--------------------------|
| 12.53 | 111 | 7.91 | 10.09 | 0.0 | 30 | 0.004 | 0.024 | 0.42 | 0.011 |



