Cooks River Ecological Health
Report Card Method Information Sheet

The ecological condition of the Cooks River is assessed across both freshwater and estuarine reaches of the catchment. Monitoring occurs across seven major subcatchments which include:

- Upper Cooks River - freshwater
- Cox's Creek - freshwater
- Cup and Saucer Creek - freshwater
- Wolli Creek - freshwater
- Bardwell Creek - freshwater
- Cooks River Estuary - estuarine
- Alexandria Canal - estuarine

Results of monitoring are presented annually in the Cooks River Ecological Health Report Card and are used to inform the community of the ecological conditional of the catchment and guide investment decisions to make a difference. The following methods collect valuable ecological data to assess the condition of the catchment.

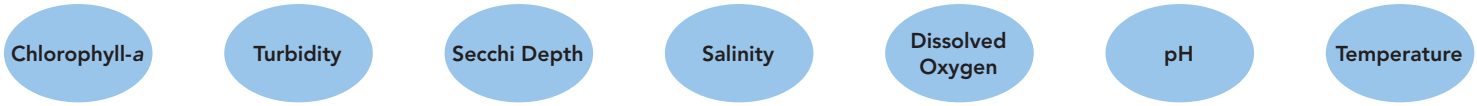
Estuarine Methods

Water Quality

Water quality monitoring is conducted throughout October to April at two sample locations in the estuarine subcatchments according to protocol developed by the NSW Office of Environment and Heritage[1].

Water quality measurement is important for assessing the baseline water quality of the Cooks River. Over time, these parameters can show trends in changes to the water's physical and chemical parameters which may be attributed directly to such things as pollution, nutrient enrichment, heavy rainfall and droughts.

Seven parameters are monitored:



Estuarine Ecosystem Health Report Card Assessment

Report card grades for estuarine reaches of the catchment apply the method outlined by the NSWOEH method[1] and include the following calculations:

1. Results for turbidity and chlorophyll-*a* are assessed against MER[2] trigger values to calculate non-compliance scores.
2. Worst case scenario for each parameter.
3. Distance from the derived trigger value score for each parameter.
4. Indicator scores for each site.
5. Site scores by combining indicator scores.
6. Assigning a zone grading for each site (see below).

Grade	Result	Definition (example)	Description
A	Very good	The indicators measured meet all of the benchmark values for almost all of the time period.	Equivalent to the best 20% of scores in the state
B	Good	The indicators measured meet all of the benchmark values for most of the time period.	Equivalent to the next 30% of good scores
C	Fair	The indicators measured meet some of the benchmark values for some of the time period.	Equivalent to the middle 30% of scores
D	Poor	The indicators measured meet few of the benchmark values for some of the time period	Equivalent to the next 15% of poorer scores
E	Very poor	The indicators measured meet none of the benchmark values for almost all of the time period.	Equivalent to the worst 5% of scores in the state

1. NSWOEH (NSW and Office of Environment and Heritage) (2013). Assessing estuary ecosystem health: Sampling, data analysis and reporting protocols. Office of Environment and Heritage, Sydney.
2. DECCW (2010), NSW Natural Resources Monitoring, Evaluation and Reporting Strategy 2010–2015, Department of Environment, Climate Change and Water NSW, Sydney.

Freshwater Methods

Water quality monitoring is conducted monthly at five subcatchment locations across the catchment, including the Upper Cooks River and Cox's Creek at Strathfield, Cup and Saucer Creek at Earlwood, and Wolli Creek and Bardwell Creek at Bardwell Park.

Additional ecological indicators of aquatic macroinvertebrates, benthic diatoms, riparian vegetation and creek channel condition are also used to assess ecosystem health. Each of these indicators are monitored in spring and autumn in major freshwater reaches across the catchment.

Water Quality

Water quality is important for assessing ecological conditions of waterways. By monitoring a number of physical and chemical parameters we can assess changes in conditions over time and investigate how pollution incidents, heavy rainfall and dry periods affect the waterways.

A suite of parameters is measured monthly at five sites across the catchment:

- pH
- Electrical Conductivity
- Turbidity
- Dissolved Oxygen
- Temperature
- Nutrients

Aquatic Macroinvertebrates

Aquatic macroinvertebrates are a commonly used waterway health indicator. Many aquatic macroinvertebrates are known to be sensitive to pollution, extreme climatic events such as flooding and drought and land use change. Macroinvertebrates that live in freshwaters include insects, crustaceans, snails and worms.

Macroinvertebrates are sampled at 10 freshwater reaches across the catchment. Samples are collected following the SIGNAL 2[3] method which provides a rapid semi-quantitative method for assessing freshwater streams.

A range of biotic indices are calculated from results of sampling which include SIGNAL score, family richness, Shannon Biodiversity Index and percentage of pollution sensitive taxa - Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies). Results of monitoring are assessed against locally derived trigger values.

Benthic Diatoms

Diatoms are indicators sensitive to nutrient and salinity pollution in waterways. Slight changes in water quality will cause change to diatoms communities and therefore these microscopic cells are more sensitive to pollution events than aquatic macroinvertebrates. For this reason, they are seen as one of the most important ecological indicators to assess waterway health.

Diatoms are sampled in spring and autumn at five locations across the catchment and the community composition assessed by the application of the Trophic Diatoms Index (TDI)[4].

Riparian Vegetation and Creek Channel Condition

Riparian vegetation habitats are essential to the overall health of a waterway and provide critical habitat for many native animals. The vegetated buffers between terrestrial and aquatic ecosystems play many vital roles in enhancing aquatic ecosystem health which include erosion control, shading, nutrient input and habitat.

Assessments are conducted using the Rapid Riparian Appraisal[5] which assesses the extent and quality of creek bank vegetation and creek channel attributes such as erosion and aquatic habitat.

Freshwater Ecosystem Health Report Card Assessment

Calculation of report cards grades for freshwater reaches of the catchment are calculated using the method developed by Healthy Waterways[6] by applying the steps below:

1. Results of water quality, macroinvertebrate, benthic diatoms, riparian vegetation and creek channel assessments are compared against local ecosystem guidelines and worst case scenarios to derive a standardised score for each parameter.
2. Standardised scores are averaged to provide a score for each River Health index.
3. Index scores are then averaged to provide a standardised score for each site.
4. Site scores are then combined to calculate average standardised scores for each subcatchment.
5. Report card grades are calculated for each subcatchment.

Standardised Score	Grade	Ecological Condition	Description
>0.95 - 1.00	A+	Excellent	All indicators comply with guideline values. Waterways have high ecological value and experience little to no human disturbance.
>0.90 - 0.95 >0.85 - 0.90 >0.80 - 0.85	A A- B+	Good	Most indicators equivalent to reference conditions and comply with regional guidelines. Waterways have favourable water quality, complex habitat structure and support a diverse macroinvertebrate community.
>0.75 - 0.80 >0.70 - 0.75 >0.65 - 0.70 >0.60 - 0.65 >0.55 - 0.60	B B- C+ C C-	Fair	Numerous indicators outside regional guideline limits and show signs of departure from reference conditions. Periodic episodes of degraded water quality are likely and the macroinvertebrate community and stream habitat are commonly degraded.
>0.50 - 0.55 >0.45 - 0.50 >0.40 - 0.45 >0.35 - 0.40 >0.30 - 0.35 >0.25 - 0.30 >0.20 - 0.25 >0.15 -0.20 0-0.15	D+ D D- E+ E E- F+ F F-	Poor	Most indicators non-compliant with guidelines and show significant departure from reference conditions. Waterways have degraded water quality and poor habitat reflected by a macroinvertebrate community dominated by pollution tolerant species.

3. Chessman B.C. (2003). New sensitivity grades for Australian river macroinvertebrates. Marine and Freshwater Research 54:95-103.
4. Kelly, M.G. & Whitton, B.A. (1995). The Trophic Diatoms Index: a new index for monitoring eutrophication in rivers. Journal of Applied Phycology 7: 433–444.
5. Findlay, S., Taylor, M., Davies, P. and Fletcher, A. (2011), Development and application of a rapid assessment tool for urban stream networks. Water and Environment Journal, 25: 2–12.
6. Healthy Waterways (2014). Healthy Waterways Report Card Methods. How are the grades calculated?