EcosystemHealth
Monitoring Program

Report Card Methods

How are the grades calculated?

Freshwater Methods

Freshwater monitoring is carried out twice a year, during spring (pre-wet season) and autumn (post wet season), at 135 representative sites across South East Queensland. Five ecological indicators are used to assess the health of freshwater ecosystems: physical and chemical, nutrient cycling, ecosystem processes, and communities of both aquatic macroinvertebrates and fish.

Aquatic Macroinvertebrates

Aquatic macroinvertebrates (insects, crustaceans, snails, etc.) are common, widespread and easily sampled. They vary in sensitivity to disturbance and reflect environmental conditions, and thus stream health, over time. Sampling methods used are based on those used for the Queensland AusRivAS (Australian River Assessment System) program.

The three indices used are:
- Number of macroinvertebrate taxa
- PET richness (number of stonefly, mayfly and caddisfly families
- SIGNAL (Stream Invertebrate Grade Number – Average Level)

Fish

Fish communities reflect a range of environmental disturbances and provide a measure of stream condition due to their mobility, long life and position near the top of the food chain. Sampling of fish is carried out using a combination of electrofishing and seine netting.

The three indices used are:
- Percentage of Native Species Expected (PONSE)
- Ratio of Observed to Expected native species (O/E)
- Percentage of alien fish

Ecosystem Processes

Measuring the rate of production reflects the vigour or 'pulse' of a stream and indicates if it is healthy or unhealthy.
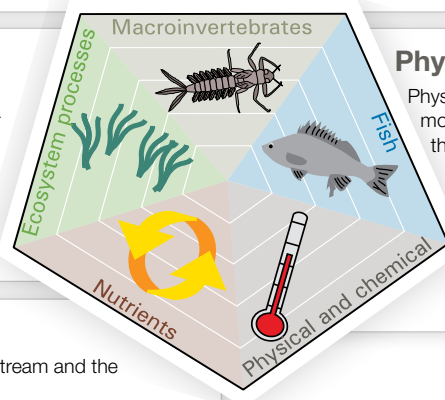
The three indices used are:
- Ratio of $\delta^{13}C$ to ^{12}C stable isotopes
- Respiration (R_{24})
- Gross Primary Production (GPP)

Physical and Chemical

Physical and chemical measures are important for monitoring direct changes in water quality and aiding in the interpretation of other measures of stream health.

The six indices used are:
- pH
- Conductivity
- Diel (24hr) range and maximum temperature
- Diel range and minimum dissolved oxygen

Nutrients

This describes the processing of nitrogen within a stream and the sensitivity of the stream to the input of nutrients.

The index used is:
- Ratio of $\delta^{15}N$ to ^{14}N stable isotopes

Macroinvertebrates
Ecosystem processes
Fish
Nutrients
Physical and chemical

Freshwater **Report Card Generation**

1. Results for each site are assessed against regional Ecosystem Health Guidelines for the corresponding stream type and standardised scores (ranging between 0 and 1) are derived.

2. The standardised scores for each of the indices within each indicator type are averaged to produce five summary scores per site.

3. The indicator scores for all sites within a reporting area are averaged to produce five summary scores per reporting area.

4. The values for each reporting area are then averaged across seasons (spring and autumn).

5. The values for the five indicator types are then averaged to give a single value for each reporting area.

6. Catchments are then ranked based on these scores and Report Card Grades are assigned.
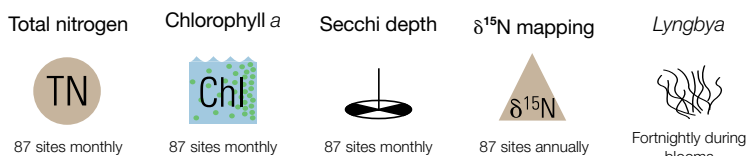

● Freshwater monitoring sites
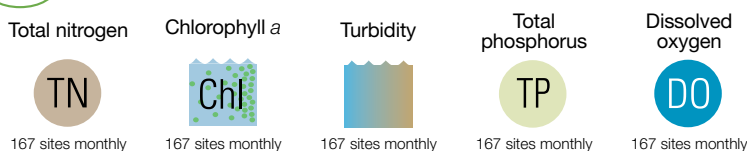
Estuarine/Marine Methods

The Estuarine and Marine Report Card Grade is calculated by combining a Ecosystem Health Index (EHI) and a Biological Health Rating (BHR) to produce a single value of ecosystem health.

Parameters used for **Ecosystem Health Index (EHI)**
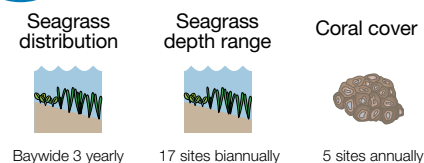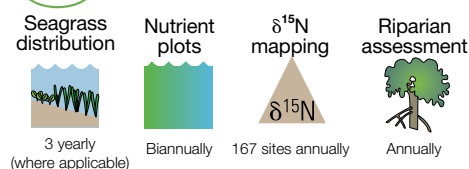
EHI Moreton Bay Indicators

Total nitrogen	Chlorophyll *a*	Secchi depth	$\delta^{15}N$ mapping	*Lyngbya*
TN	Chl		$\delta^{15}N$	
87 sites monthly	87 sites monthly	87 sites monthly	87 sites annually	Fortnightly during blooms

EHI Estuarine Indicators

Total nitrogen	Chlorophyll *a*	Turbidity	Total phosphorus	Dissolved oxygen
TN	Chl		TP	DO
167 sites monthly	167 sites monthly	167 sites monthly	167 sites monthly	167 sites monthly

Parameters used for **Biological Health Rating (BHR)**

BHR Moreton Bay Indicators

Seagrass distribution	Seagrass depth range	Coral cover
Baywide 3 yearly	17 sites biannually	5 sites annually

BHR Estuarine Indicators

Seagrass distribution	Nutrient plots	$\delta^{15}N$ mapping	Riparian assessment
		$\delta^{15}N$	
3 yearly (where applicable)	Biannually	167 sites annually	Annually

EHI Estuarine and Marine **Report Card Generation** BHR

Median Map

Annual Median
- 0–0.5
- 0.5–1.0
- 1–2
- 2–5
- 5–10
- 10+
- No Data
- Sample sites

ESTUARINE RIVER MARINE BAY
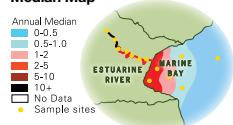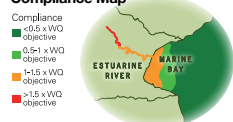
1. From a total of 254 estuarine and marine sites, maps are produced for each indicator which show the median values for each site from the reporting year.

Compliance Map

Compliance
- <0.5 x WQ objective
- 0.5–1 x WQ objective
- 1–1.5 x WQ objective
- >1.5 x WQ objective

ESTUARINE RIVER MARINE BAY

2. Compliance scores are then calculated for each indicator as the proportion of the reporting zone that complies with the Queensland Water Quality Guidelines, 0 representing non-compliance and 1 representing total compliance.

EHI Map

EHI values
- 0–0.25
- 0.25–0.5
- 0.5–0.75
- 0.75–1

ESTUARINE RIVER MARINE BAY

3. An Ecosystem Health Index (EHI) for the reporting zone is calculated by averaging the compliance scores for each indicator.

The BHR assesses the biological indicators measured by the EHMP which don't have established guidelines. Half of the total BHR score is based on results of the riparian assessment program, which assesses the percentage of unmodified estuarine habitat for each estuarine system. The other half of the total BHR score is based on the results of the remaining biological health indicators for estuaries and the Bay. The BHR ranges between 0 and 1 for each zone, with 1 representing an unmodified and healthy ecosystem and 0 representing a highly modified and unhealthy ecosystem.

Riparian assessment

Naturalness
- Natural
- Non-natural

ESTUARINE RIVER

Report Card 2008 for the waterways of South East Queensland

ESTUARINE RIVER MARINE BAY
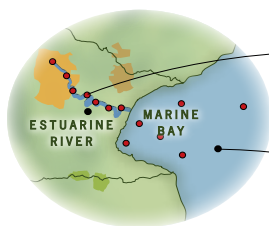
C Estuarine River
Fair water quality with several indicators non-compliant for part of the year.

B Marine Bay
Good water quality, non-compliance for one or more indicators during the year.

A single EHI value and a single BHR value are calculated for each waterway by averaging the indicator ratings. These two values are combined together with expert opinion to provide a single value used to assign a Report Card Grade.

HEALTHY WATERWAYS
Because we're all in the same boat