

About Ecohealth

Ecohealth is an aquatic ecosystem monitoring program that measures the health of our rivers and estuaries for the plants and animals that live in them.

Ecohealth reports on the condition of key environmental indicators including water quality, riparian (riverbank) vegetation, geomorphology (channel shape), and fish and macroinvertebrate (waterbug) communities.

This information enables natural resource managers to determine where our rivers are under stress and where to invest in environmental management activities. It also helps Councils and State Government agencies to meet local and state monitoring, evaluation and reporting requirements.

Ecohealth does not comprehensively assess human health issues in the rivers such as drinking water quality, if it's safe for swimming, heavy metal contamination, disease, viruses or our ability to harvest shellfish or fish.



Macleay River, Georges Junction

Ecohealth indicators

Scientists and natural resource managers use the health of particular components of an ecosystem to indicate if there are stresses to the habitat as a whole. The Ecohealth team has ensured that the selection of indicators used in the Ecohealth program have been subject to a scientific review process.

Water Quality provides an understanding of how changes in land use practices within the catchment are affecting the health of our rivers and estuaries. Ecohealth measures oxygen level, salinity, acidity, murkiness (turbidity) and nutrients in our waterways.

Riparian vegetation is important for maintaining good water quality, stabilising riverbanks and providing habitat for animals including macroinvertebrates and fish. Ecohealth looks at the occurrence of weeds, structure of riparian vegetation, habitat (e.g. fallen logs) and current management (e.g. fencing).

Geomorphic condition assesses bank condition (e.g. slope, bank failure, exposed tree roots and undercutting), bed condition (e.g. active erosion and smothering of the bed substrate by high loads of fine sediment), and trampling by stock.

Macroinvertebrates are waterbugs such as worms, beetles, mayflies and shrimps that are sensitive to changes in aquatic habitat, pollution and poor water quality. Ecohealth looks at the types of waterbugs occurring at different freshwater sites in our rivers. Waterbugs are not assessed in estuaries.

Fish provide a longer-term measure of river condition as they are highly mobile, require good habitat to breed, are long-lived and occur at the top of the food chain. Ecohealth samples the type and number of freshwater fish occurring in our rivers.

Ecohealth scoring and grading

Information about each of the indicators was collected from 44 sites across the Macleay catchment over the course of 13 months. These were used to calculate scores for each indicator at each site, based on how often the measured values satisfied regional and national guidelines for healthy rivers. The condition scores were then given a corresponding grade (see below).

Condition Score	Grade	Result
91-100	A	Excellent
76-90	B	Good
61-75	C	Fair
46-60	D	Poor
0-45	F	Very Poor

This scoring and grading system is based on the traditional format of a school report card, with ratings ranging from a high of 'A', through to intermediate ratings of 'B', 'C' and 'D', to the lowest possible score of an 'F'. Secondary grades of + and - are included to provide greater resolution within a grade, and to better help show improvements over time.

Interpreting the results

The diagram to the right shows the Ecohealth grading system, where a grade is given for water quality, riparian condition, geomorphic condition, aquatic macroinvertebrates and fish. Based on the average of these grades, an overall grade is awarded to the site. Overall grades are then also awarded for each river system, subcatchment, and for all freshwater and estuarine sites.

Site Name	Example of Site Grades
B-	Average of all grades for the Site
A-	Water Quality grade
B-	Riparian Condition grade
C+	Geomorphic Condition grade
C+	Macroinvertebrate grade
B+	Fish grade

Further information

Visit KSC's website for the 2016 Macleay Ecohealth Technical Report or further information on the environment and natural resources within the Macleay Catchment www.kempsey.nsw.gov.au/environment/index.html

Project partners

This project was jointly funded by Kempsey Shire Council, the NSW Office of Environment and Heritage (OEH) Estuary Management Program, and North Coast Local Land Services and Northern Tablelands Local Land Services through funding from the Australian Government's National Landcare Program and NSW Government's Catchment Action NSW Program.



What we found

A total of 44 sites in 26 waterways were used to calculate an overall condition of C- for the Macleay catchment (see below). The estuarine tributaries were in the poorest condition, followed closely by the tableland tributaries.

Most of the stream network in the Macleay catchment was in good or moderate geomorphic condition. More than one-third of the stream network was in poor condition in four subcatchments: Commissioners Waters, Salisbury Waters, Bakers Creek and Nulla Nulla Creek. All four subcatchments have been significantly cleared of catchment and riparian vegetation in the reaches with poor geomorphic condition, highlighting the importance of maintaining healthy native vegetation to promote channel stability.

Riparian condition was poor across the 44 Ecohealth sites. The main issues were dominance of invasive weeds, vegetation clearing that has reduced riparian connectivity and isolated riparian vegetation from large patches of remnant vegetation, and damage from livestock. The freshwater tributaries had high quality riparian vegetation (and other positive Ecohealth grades), identifying the important role of riparian restoration in the catchment.

Water quality was poor across the Macleay catchment, particularly in the Tablelands where the majority of sites recorded very poor water quality driven by low dissolved oxygen, elevated pH and exceptionally high nutrient concentrations. Freshwater reaches of the main stem of the Macleay River consistently recorded the best water quality in the catchment. It is likely that the extensive beds of aquatic macrophytes in the Macleay River play an important ecological role in regulating water quality.

Reference sites in the Macleay catchment had the greatest richness and abundance of aquatic macroinvertebrates observed in the Northern Rivers bioregion. This led to lower scores at sites that did not have such high abundance or diversity. However, these sites with lower scores would potentially recover quickly as new colonists respond to improved water quality and habitat availability.

Freshwater fish communities were in good condition across the Macleay catchment, and in excellent condition in Five Day Creek and Nulla Nulla Creek in particular.



Pelican Island rehabilitation project to improve foreshore habitat. Photo © R. Kemsley, KSC.

Antimony and Arsenic in River Sediment and Water

Antimony (Sb) and arsenic (As) concentrations were measured in the water column and sediments at Bakers Creek (a historical point source of contamination) and at seven sites along the Macleay River from Georges Junction to Jerseyville.

Water column Sb at Bakers Creek ranged from 37 to 96 times the ANZECC guidelines for healthy aquatic ecosystems, but no site on the Macleay River exceeded the ANZECC Sb trigger value for healthy aquatic ecosystems.

Water column As at Bakers Creek ranged from 1.4 to 2.7 times the ANZECC trigger value for healthy aquatic ecosystems. The Macleay River at Jerseyville exceeded the ANZECC As trigger value for healthy aquatic ecosystems once (November 2015).

Sediment Sb at Bakers Creek ranged from 72 to 164 times the national sediment low guideline value. The national sediment low guideline value was exceeded at Georges Junction, Bellbrook, Kinchela and Jerseyville.

Sediment As at Bakers Creek ranged from 4.4 to 7 times the national sediment low guideline value. No site in the Macleay River exceeded the national sediment low guideline value during the study period.

The Macleay River Working Group comprises state and local government, industry, researchers and the community and provides a forum to discuss the As and Sb contamination issue. Derelict Mines has commissioned an assessment of historic workings of As and Sb in the Macleay Catchment and the final report is expected in early 2017.

What action is happening?

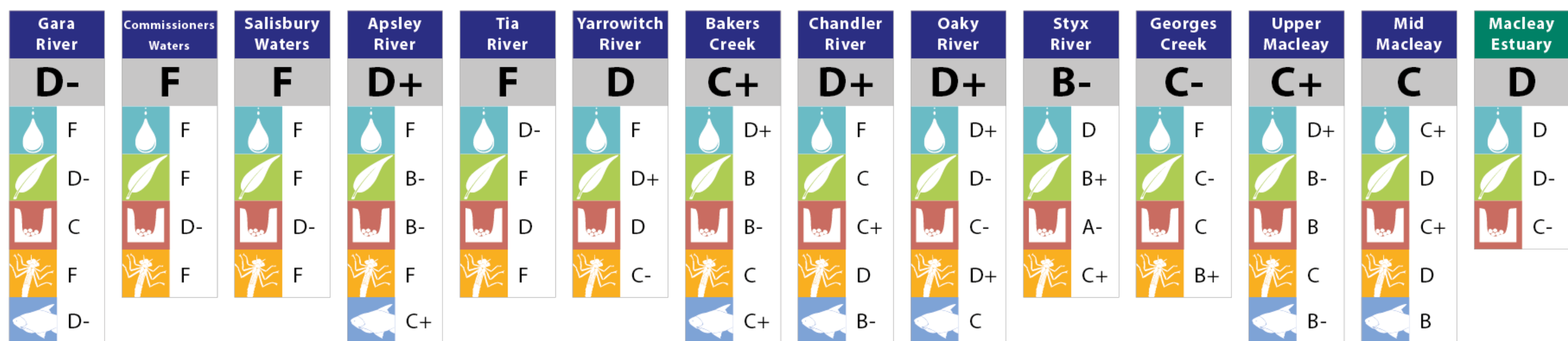
The Kempsey Coastal Zone Management Plan (CZMP) has been completed for the Kempsey LGA coastline, with a number of recommended environmental programs initiated. The Macleay River Estuary CZMP was prepared in 2012 and is in the process of being reviewed for certification. Estuary Management Plans for Killick Creek, Korogoro Creek, and Saltwater Creek and Lagoon have been prepared and are about to be reviewed and upgraded.

Local Land Services is working with stakeholders on a strategy to improve the quality of water discharged from the Clybucca Collombatti backswamp area into the lower Macleay estuary.

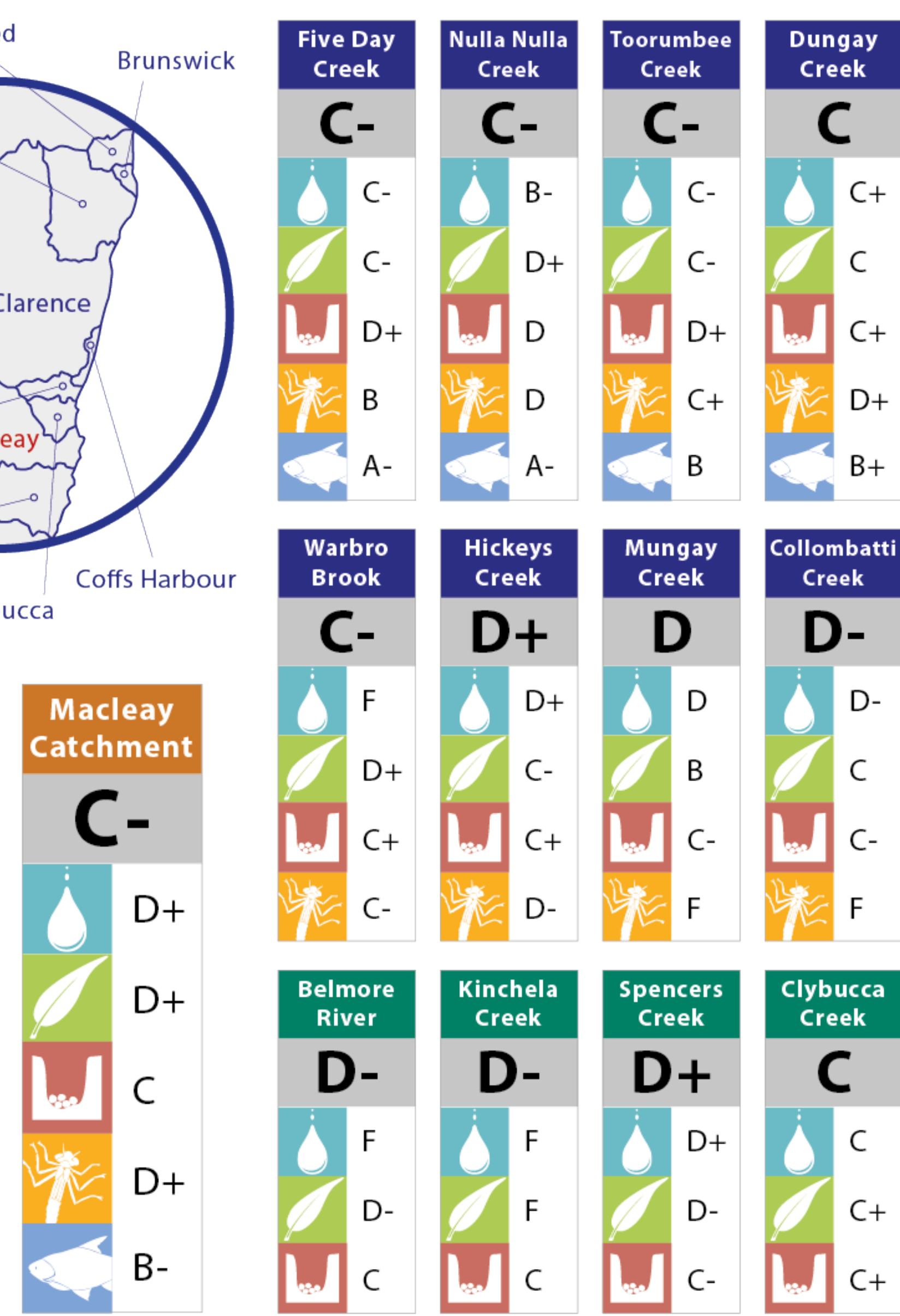
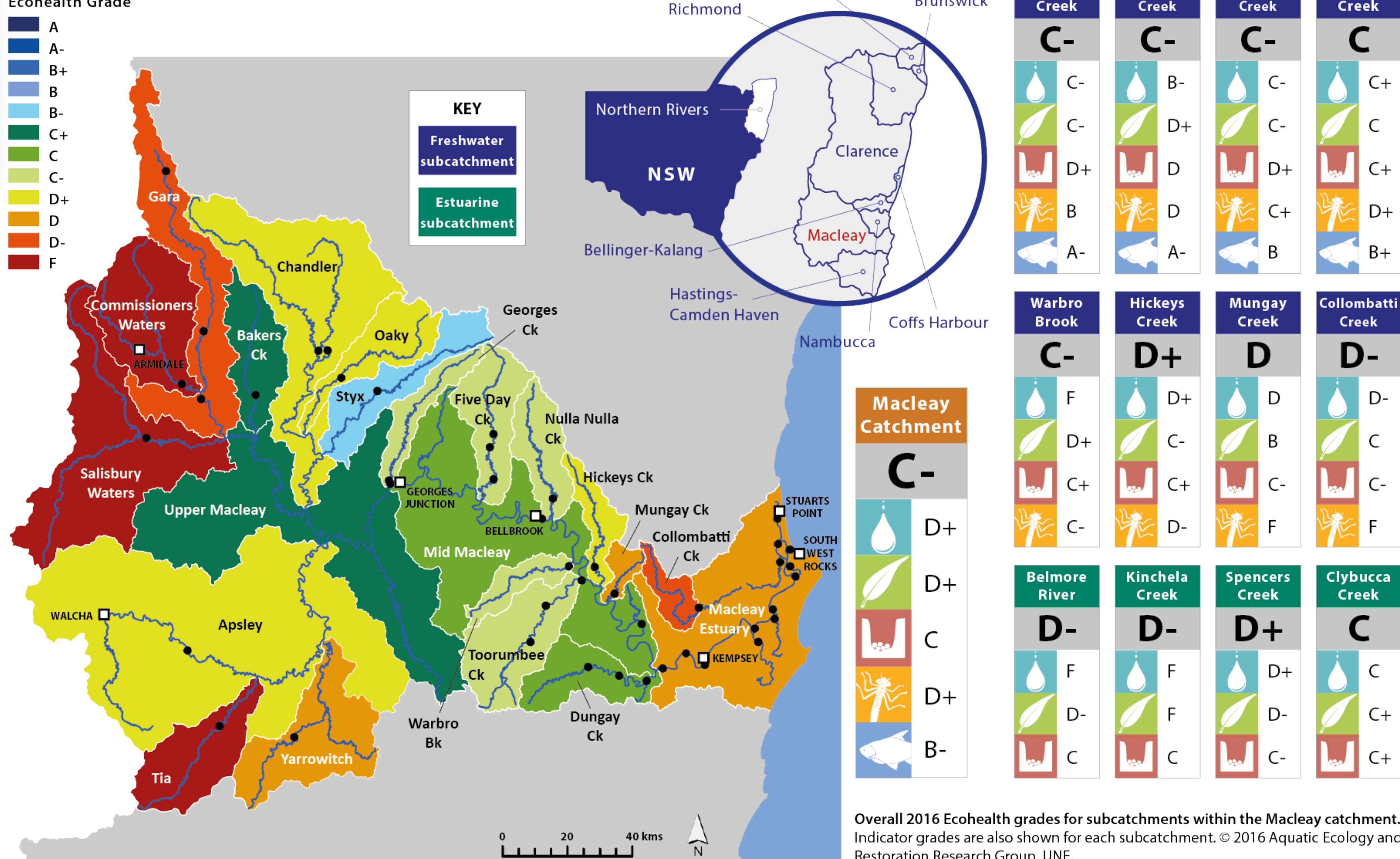
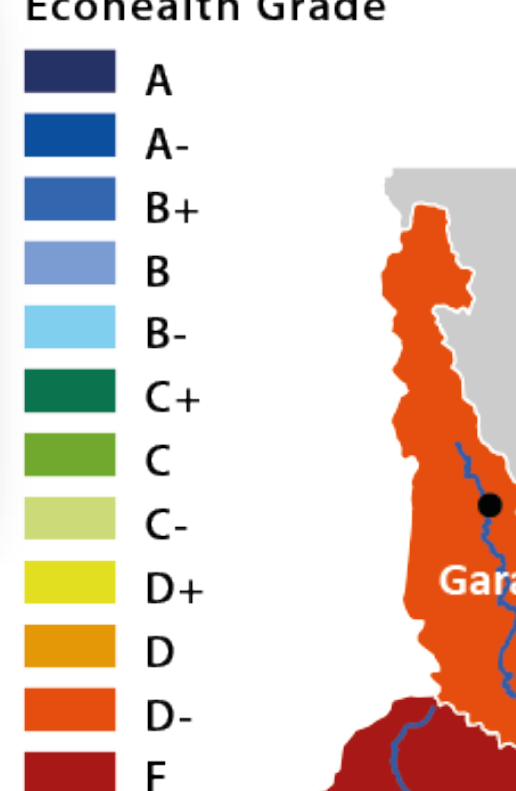
Kempsey Shire Council (KSC) has recently implemented a number of riverine and estuarine rehabilitation projects. These include the Pelican Island foreshore habitat improvement project, The Boyters Lane/Spencers Creek riparian improvement project and the Sherwood/Macleay River riparian rehabilitation project.

KSC has recently completed a survey of aquatic plants of the Macleay River. KSC is currently preparing a Migratory and Threatened Shorebird management strategy and a Biodiversity Strategy for the Kempsey LGA.

Landcare groups are working on a number of riverbank and riparian improvement projects throughout the Macleay catchment. KSC continues to implement a series of weed control programs targeting species such as Sharp Rush, Tropical Soda Apple, Cockspur Coral Tree and Senegal Tea.



Overall Subcatchment Ecohealth Grade



Overall 2016 Ecohealth grades for subcatchments within the Macleay catchment. Indicator grades are also shown for each subcatchment. © 2016 Aquatic Ecology and Restoration Research Group, UNE.