

Water in the Northern Coral region

Water for a Healthy Country Flagship

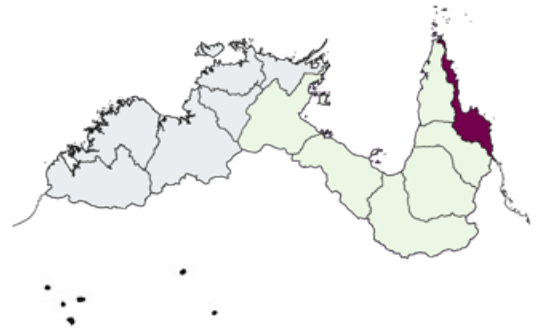
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Water for a Healthy Country



The CSIRO Northern Australia Sustainable Yields Project provides science to underpin the sustainable planning and management of the water resources of northern Australia

Project overview

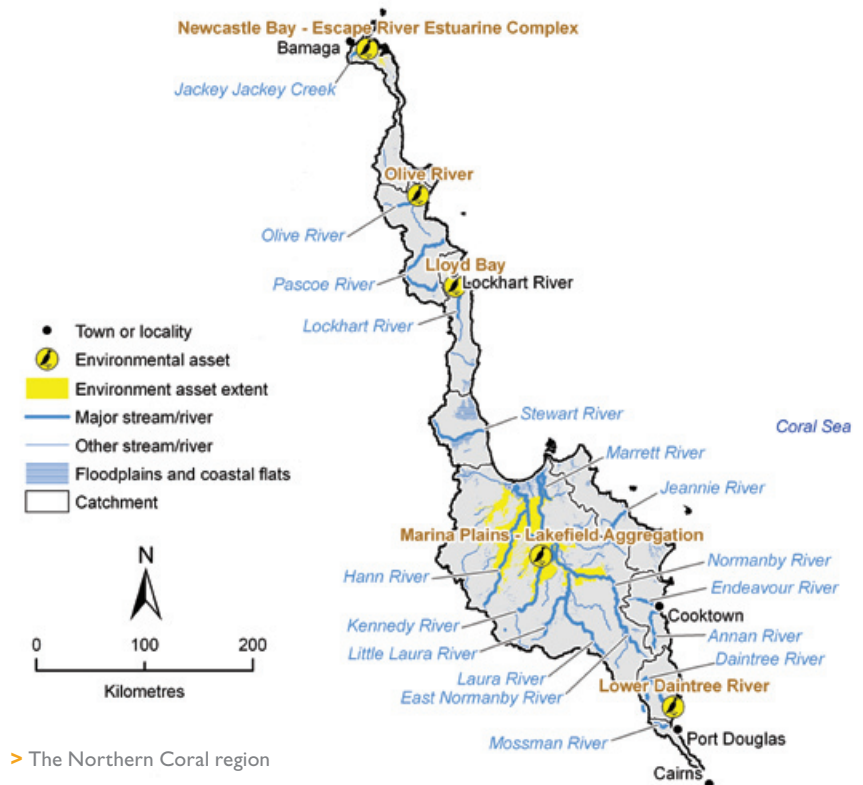
Led by CSIRO's Water for a Healthy Country Flagship, the Northern Australia Sustainable Yields Project is the nation's most comprehensive assessment of water availability in northern Australia. From Broome in Western Australia to Cairns in Queensland, this project provides critical information on current and likely future water availability for the 13 regions of northern Australia, an area renowned for its high rainfall, pristine tropical environments and relatively low level of development. This information will help governments, industry and communities consider the environmental, social and economic aspects of the sustainable use and management of the water assets of the north.



The region

The Northern Coral region extends from the tip of Cape York, along the eastern flank of the Great Dividing Range to Port Douglas in the south. The region comprises nine river basins. From north to south these are: Jackey Jackey Creek and then Olive – Pascoe, Lockhart, Stewart, Normanby, Jeannie, Endeavour, Daintree and Mossman rivers. Only the Normanby (25,000 km²) is greater than 5000 km² in area. The region covers nearly 47,000 km², and most of the rivers flow west to east, originating in the Great Dividing Range and flowing through extensive floodplains. The east coast waterways are relatively short with small catchments due to the close proximity of the mountain ranges. Eastern wetlands are extensive but with few lagoons. Artesian springs associated with the Great Artesian Basin are also evident, particularly at the northern tip of the region. The coast has recently formed dune fields and beach ridges, which are extensive in Cape Bedford and Cape Flattery near Cooktown, and the Olive River.

The northerly trending high ranges and plateaux rise up to 800 m and are flanked by foothills and broad low-relief plains. Extensive alluvial fans have developed in the lower reaches of many of the main



river systems, such as the Normanby River which discharges into Prince Charlotte Bay.

The region consists of a complex geology dominated by young volcanic rocks in the north and older metamorphic and intrusive rocks of various ages running north to south along the eastern margin

of the region. These encompass the high altitude, high rainfall areas of Iron Range and McIlwraith Range. Deeply dissected sandstone plateaux and ranges lie in the south of the region adjacent to the undulating lowlands composed of residual weathered sands and flat plains of colluvial and alluvial clays, silts and sands.

Historical and recent climate

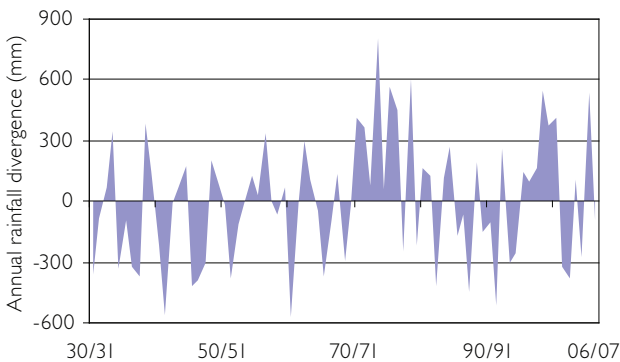
The Northern Coral region has a high inter-annual variability in rainfall and hence runoff and recharge. Coefficients of variation, however, are among the lowest of the regions across northern Australia, but the region may experience long periods of many years that are considerably wetter or drier than average.

The mean annual rainfall for the region is 1338 mm. Mean annual potential evapotranspiration is 1853 mm. The mean annual runoff averaged over the modelled area of the Northern Coral region is 373 mm, 28 percent of rainfall. These values are amongst the highest in comparison to other regions across northern Australia. Under the historical climate the mean annual streamflow over the Northern Coral region is estimated to be 17,364 GL.

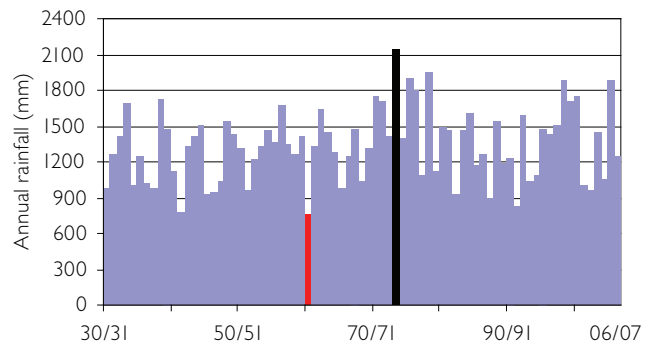
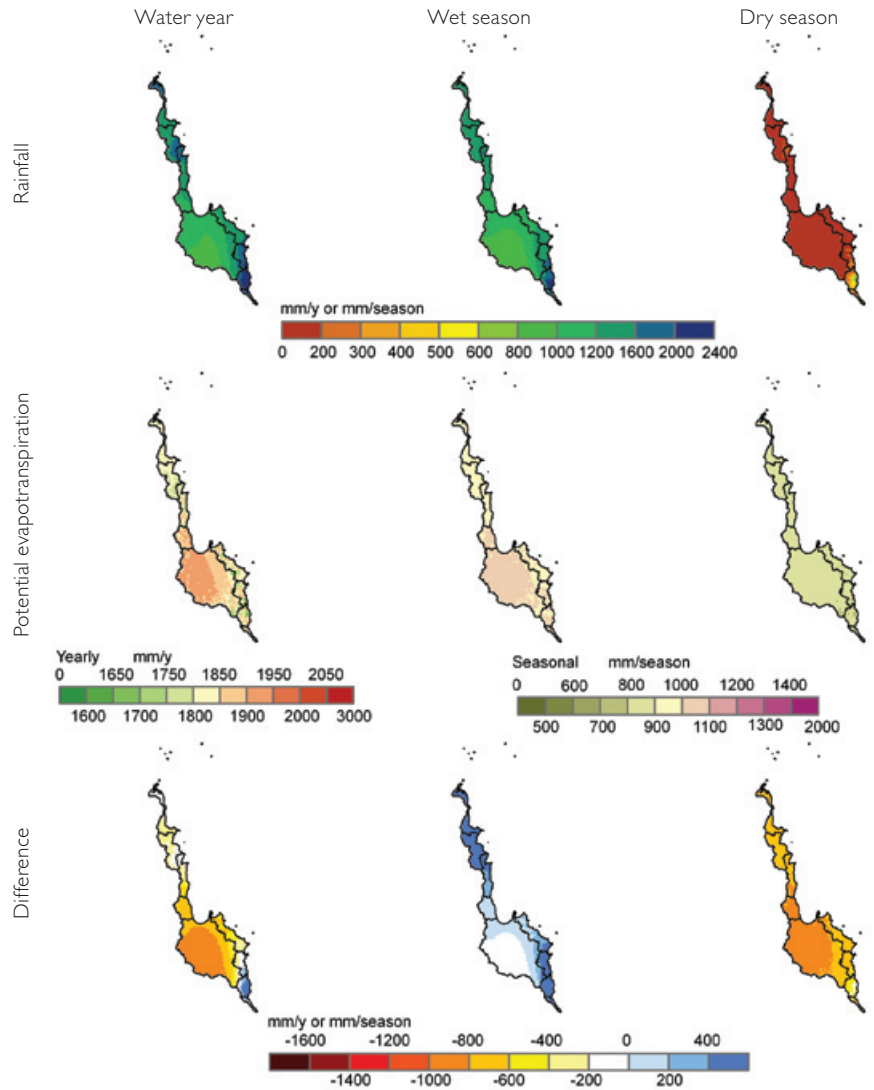
> Distribution of historical mean annual (water year), wet season and dry season rainfall and potential evapotranspiration and their difference (the annual rainfall deficit). Water year – September to August; wet season – November to April; dry season – May to October

> Historical mean annual rainfall, potential evapotranspiration and modelled runoff

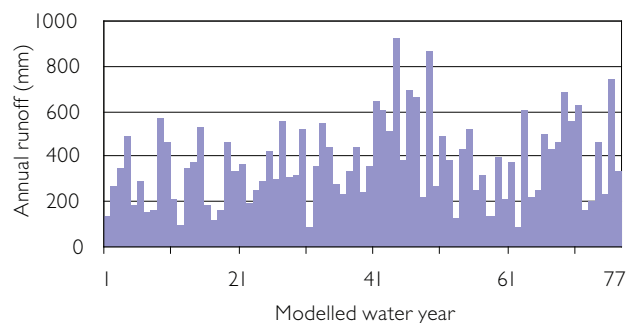
Rainfall	1338 mm
Potential evapotranspiration	1853 mm
Runoff	373 mm (28 % of rainfall)



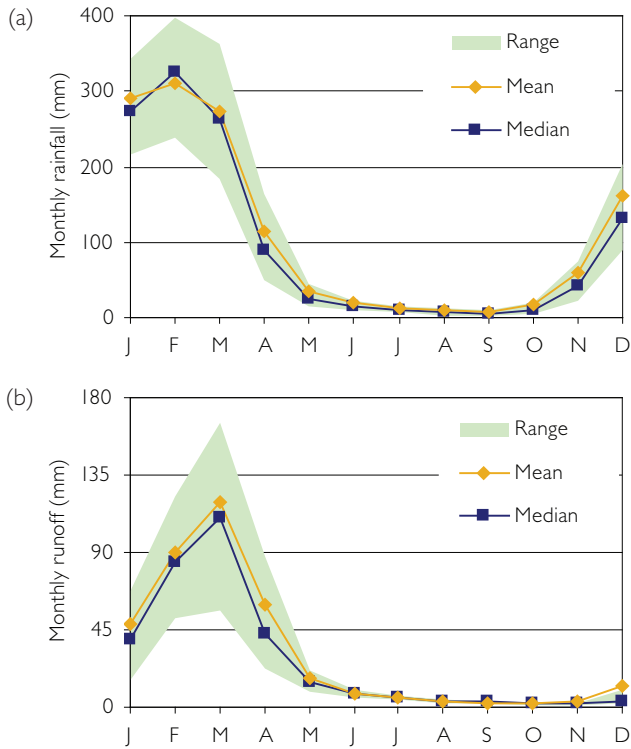
> Divergence of historical annual rainfall from the long-term mean (1930 to 2007)



> Historical annual rainfall (1930 to 2007)



> Modelled annual runoff



There is a strong seasonality in rainfall patterns, with 92 percent of rain falling in the wet season, and a very high dry season potential evapotranspiration. The region has a relatively high rainfall intensity, and hence rapid runoff and short lag between rainfall and runoff with a slightly increasing amount and intensity of rainfall over the historical (1930 to 2007) period.

The Northern Coral region has a recent (1996 to 2007) climate record that is statistically significantly slightly wetter than the historical record with rainfall 8 percent higher and runoff 19 percent higher.

> Historical monthly (a) rainfall and (b) runoff (Range is the 25th to 75th percentile monthly rainfall or runoff)

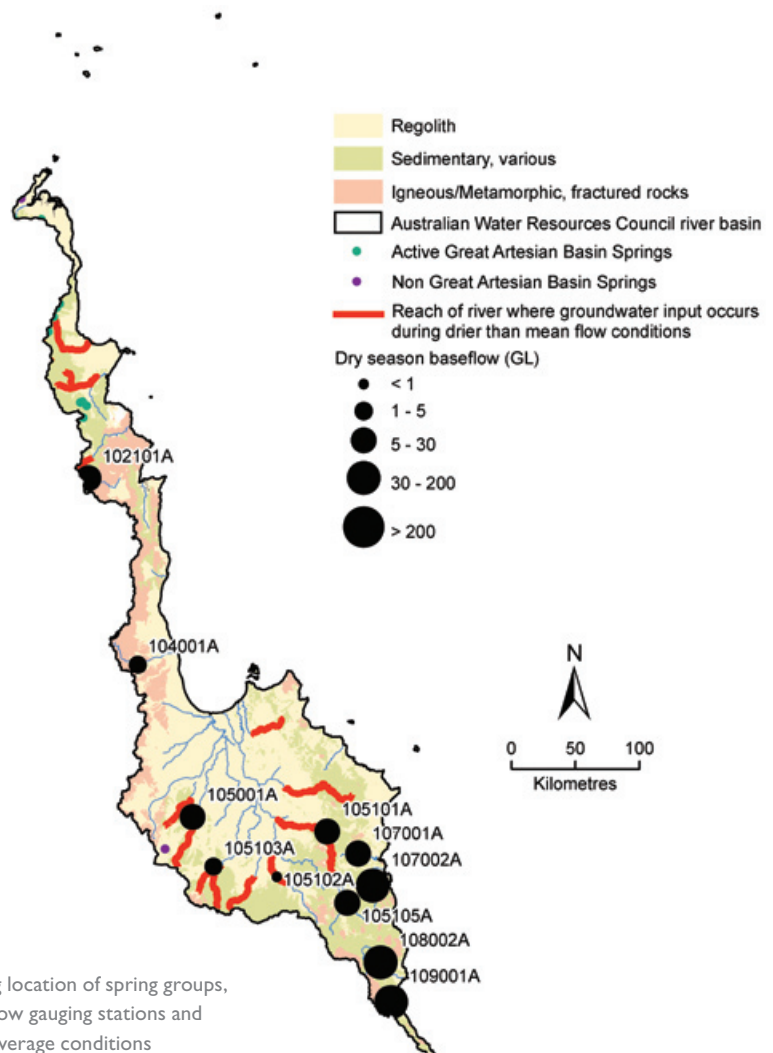
Historical and current water resources

There is a strong north–south and east–west rainfall gradient and between 10 and possibly greater than 50 percent of rainfall flows as runoff.

Annually, as potential evapotranspiration is greater than rainfall, the region can be described as being water-limited – in other words there is more energy available to remove water than there is water available to be removed. The far south-east, however, receives more rain than can be evaporated throughout the entire year. Most of the region has a rainfall surplus through the wet season months of November to April.

Most groundwater use is sourced from the Gilbert River Formation of the Great Artesian Basin, which occurs extensively in outcrop in the region. Younger, shallow aquifers do not provide a viable groundwater resource in this region, due to variable thickness and groundwater quality and because these aquifers can empty during the dry season. Groundwater is, however, an important source of baseflow to a number of rivers in this region. Groundwater extraction volumes are negligible, relative to the volume of baseflow to rivers, and hence are not likely to significantly impact dry season streamflows.

> Surface geology of the Northern Coral region showing location of spring groups, historical mean dry season baseflow at selected streamflow gauging stations and reaches of river that remain perennial under drier than average conditions



What the future holds

The future (~2030) climate was modelled and the range of future climate series ranked. The 'median future climate' represents the mid-range conditions. The 'wet extreme future climate' represents the wettest end of the range and the 'dry extreme future climate' represents the driest end of the range.

Modelling suggests that future (~2030) conditions will be similar to historical conditions, and future runoff and recharge will also be similar to historical levels, and lower than the recent past.

Annual and seasonal flows do not change much under the median future climate; therefore, there is little change in flood and near-dry conditions.

There are large changes to the flood and near-dry conditions under the wet and dry extreme future climates which could have environmental impacts. There is little chance that streamflow will cease in any year under future climates.

At environmental assets, surface water flows are highly dominated by wet season flow, with dry season flows only a small fraction of total annual flow. However, environmental assets depend on this strong seasonality, and any significant changes in the frequency and duration of wet season high flows and dry season low flows are likely to have an environmental impact.



> Cloud covered Thornton Peak with sugarcane in foreground, north-east Queensland.
Courtesy of CSIRO Publishing

This assessment of surface and groundwater availability is based on limited availability of quality data for the region.

For further information:

Water for a Healthy Country Flagship

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