

Water in the South-West Gulf region

Water for a Healthy Country Flagship

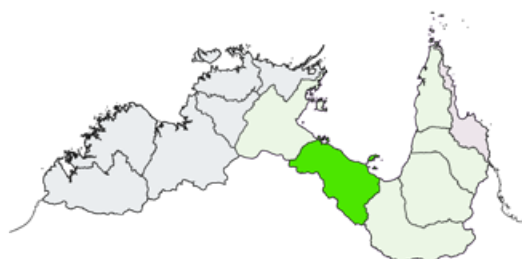
National Research
FLAGSHIPS
Water for a Healthy Country



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.



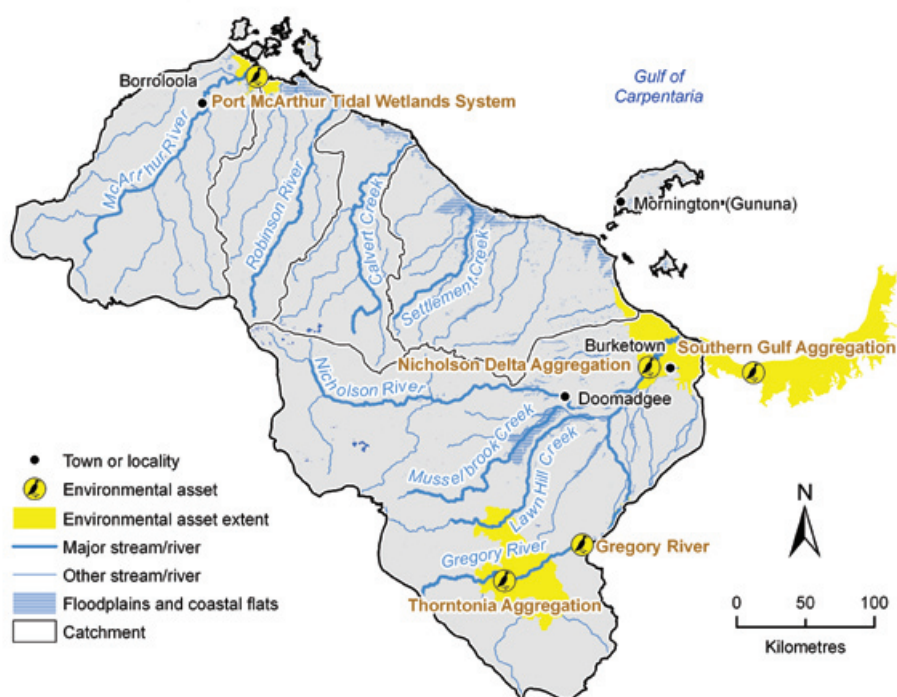
The region

Five major river systems drain the South-West Gulf region into the Gulf of Carpentaria. The McArthur, Robinson and Calvert rivers drain the low-lying country of eastern Northern Territory. Settlement Creek and Nicholson River (which includes the Gregory River) drain the open floodplains of Queensland. Fed by limestone springs, the immense Gregory River is one of few rivers in this region that flow all year round due to a strong groundwater influence in the area from Australia's largest karst terrain. The region covers 112,000 km², including Mornington Island.

The low relief results in high tidal reaches, extending over 100 km inland from the coast. Highly braided channels dominate the landscape making gauging of streamflow difficult with channels migrating under annual floods.

There are three major aquifer types in the region: fractured rocks, karstic carbonate rocks and Cretaceous sediments.

The Gregory River and its inland wetlands are part of the Thornton Aggregation, where more than half of Queensland's international migratory birds can be found. The Gregory's year-round flow is essential to the



> The South-West Gulf region

survival of these wetlands and its discharge is also critical to the health of the Gulf of Carpentaria's seagrass beds, dugong and prawn populations.

Grazing is the region's main industry, though it is limited by the extent of

suitable pastoral land resources. Other activities include mining, tourism and conservation, as well as recreational and commercial fishing. The population is estimated to be less than 3000.

Historical and recent climate

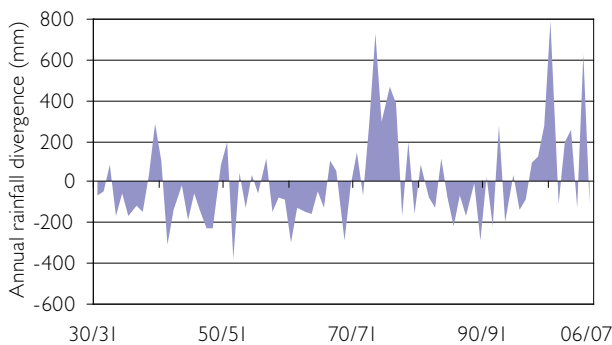
The South-West Gulf region has a very high inter-annual variability of rainfall and hence also surface water runoff and groundwater recharge. Coefficients of variation are 0.39 and 1.0 for rainfall and runoff, respectively. These are among the highest of the regions across northern Australia and reflect multiple years of significantly below average and above average rainfall.

Seasonality is extreme. Ninety-four percent of rain falls in the wet season. The region has a relatively high rainfall intensity and hence rapid runoff and short lag between rainfall and runoff. There has been a slight increase in rainfall intensity over the historical (1930 to 2007) period.

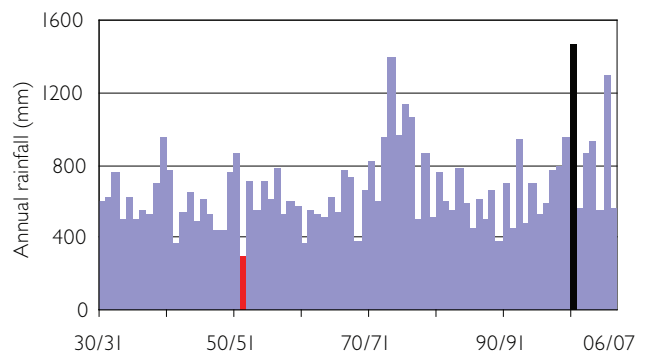
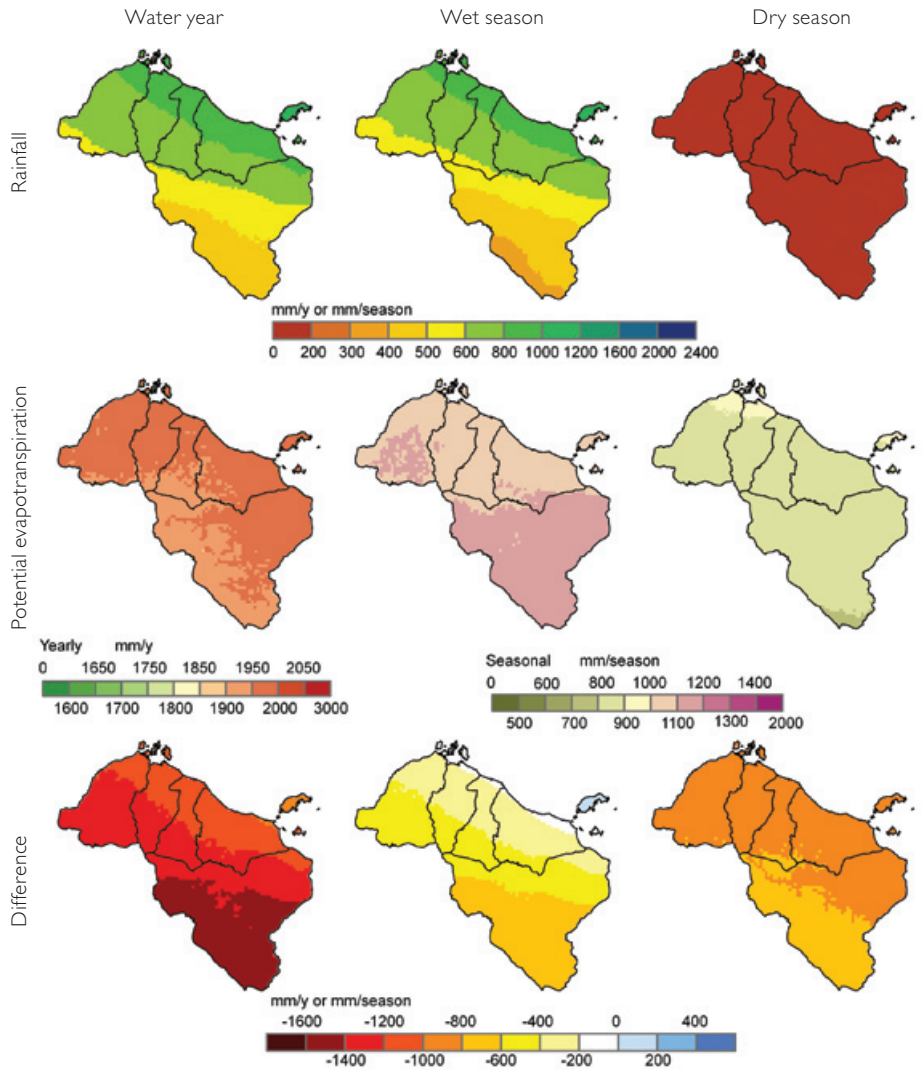
> Distribution of historical mean annual (water year), wet season and dry season rainfall and potential evapotranspiration and their difference (the annual rainfall deficit). Water year – September to August; wet season – November to April; dry season – May to October

> Historical mean annual rainfall, potential evapotranspiration and modelled runoff

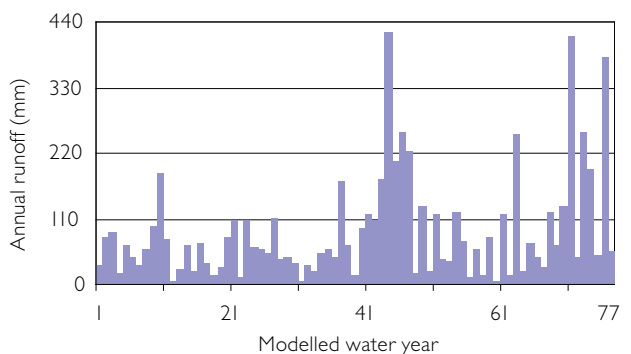
Rainfall	670 mm
Potential evapotranspiration	1961 mm
Runoff	89 mm (13 % of rainfall)



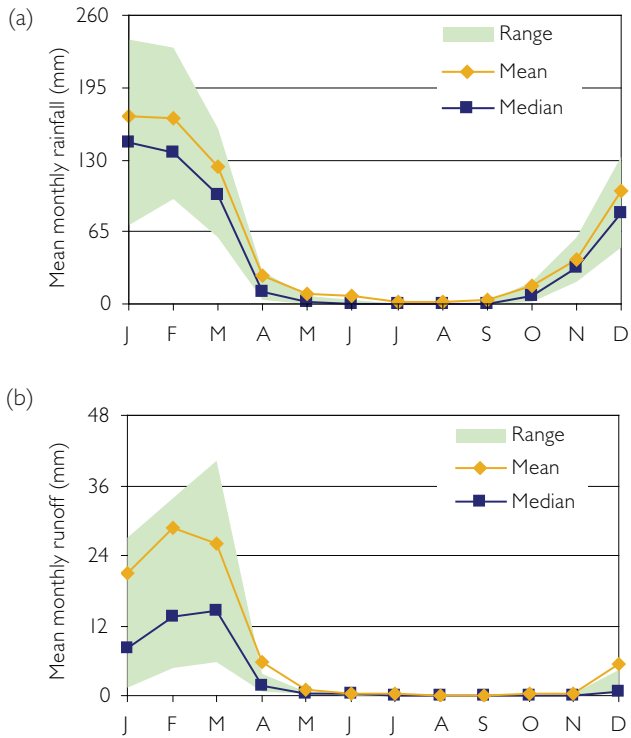
> Divergence of historical annual rainfall from the long-term mean (1930 to 2007)



> Historical annual rainfall (1930 to 2007)



> Modelled annual runoff



The historical (1930 to 2007) mean annual rainfall for the region is 670 mm. Mean annual potential evapotranspiration is 1961 mm. Annually, potential evapotranspiration is generally greater than rainfall and thus the region is annually water-limited; in other words there is more energy available to remove water than there is water available to be removed.

The South-West Gulf region has a recent (1996 to 2007) climate record that is 27 percent wetter than the historical climate. This has resulted in a 78 percent increase in runoff in the recent past compared to the historical mean.

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

Historical and current water resources

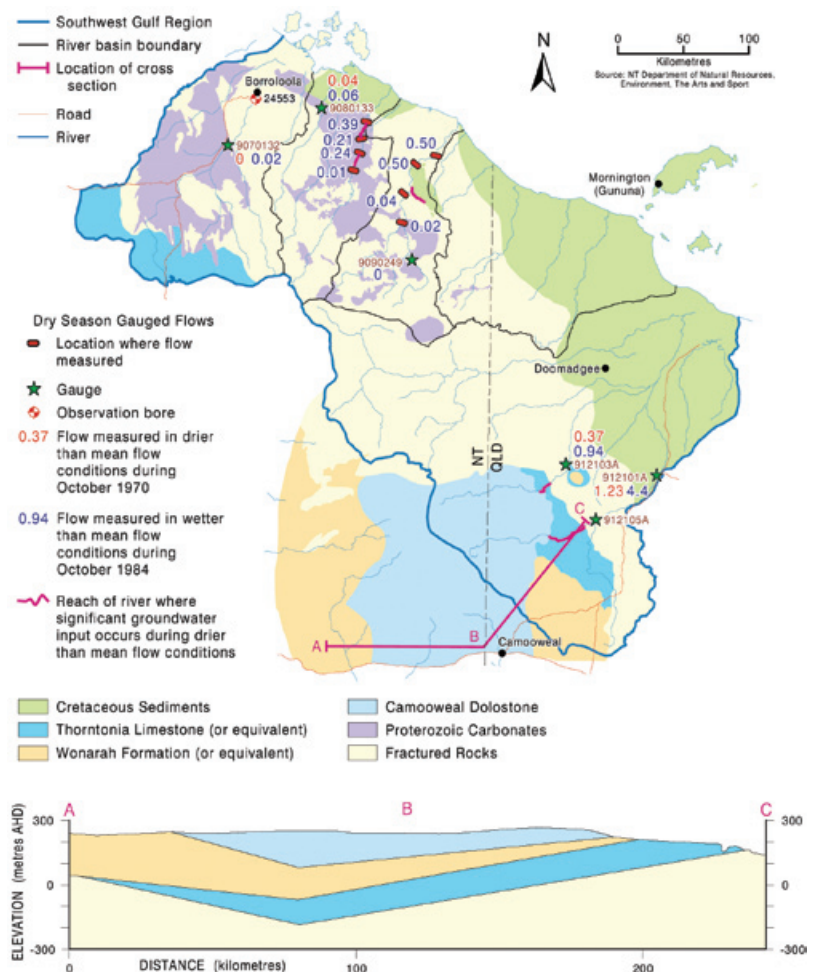
There is a strong north-south rainfall gradient across the region and runoff varies from 20 to 4 percent of rainfall across the region. Rainfall and runoff generation both decline with distance from the coast but otherwise show little spatial variation. Lower river reaches are characterised by flood conditions in the wet season.

The mean annual runoff averaged over the modelled area of the South-West Gulf region is 89 mm, 13 percent of rainfall. Under the historical climate the mean annual streamflow over the South-West Gulf region is estimated to be 9958 GL.

There is minimal and unregulated use of surface water in the region. There are no large surface water storages in this region.

Current rates of extraction from the aquifers in the region are unknown. Mining use from the karstic rock aquifers (e.g. Thornton Limestone) is expected to be large, but extraction and re-use figures are not available. Observations from local residents have highlighted concerns at the decline in Gregory River streamflow, which may relate to decreased input from discharging groundwaters.

Significant contributions of water from the Gregory River to shallow aquifers play an important role in supporting coastal wetland environments. For all environmental assets, there has been significantly more flow recently and therefore there are fewer low flow days and more high flow days.



> Hydrogeology of the South-West Gulf region showing historical mean dry season flows 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 wet end of the range and the 'dry extreme future climate' represents the dry end of the range.

Modelling suggests that the future (~2030) median climate will be slightly drier than the historical climate and drier than the recent climate. Under the wet and dry extreme future climates, conditions are wetter and drier, respectively.

Annual and seasonal flows do not change much under the median future climate; hence there is little change in the flow regime for flood and near-dry conditions. There are moderate changes to these streamflow regimes under wet and dry extreme future climates which may have negative environmental impacts.

The major aquifers in the region with potential for development for irrigated agriculture occur in the karstic rocks of the Camooweal Dolostone and Thornton Limestone. Potential for groundwater development of the karstic rock areas of the region is limited by their low recharge rates and the environmental significance of their aquatic ecosystems. The perennial rivers in the region – the Gregory, Calvert and Robinson rivers and Lawn Hill Creek – source their dry season flow from karstic rock aquifers.



> Robinson River (2008). Courtesy of the Northern Territory Department of Natural Resources, Environment and The Arts

This assessment of surface and groundwater availability is based on the limited water-related data available for the region.

For further information:

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