

Hydrology performance targets:

The regional council will continue to implement and improve a prioritised State of the Environment (SOE) monitoring programme and monitor compliance with, and the effects of, the exercise of resource consents and regional plans by:

- Operating a region-wide hydrometric network for the measurement, recording and reporting of rainfall, river flows, lake, groundwater and tide levels – **ACHIEVED.**
- Network required to have no more than seven days of missing records per site annually – **NOT ACHIEVED.**
- Relevant information archived and available within three months of collection – **NOT ACHIEVED (58 percent achieved, non-archived data as a consequence of droughts and storms).**
- Establish water management zones on a prioritised basis for allocation of freshwater resources by 31 December 2010 – **ACHIEVED.**
- Provide hydrometric information and advice in an accurate and timely way – **NOT ACHIEVED (full report due 2012)..**
- Report the results from the SOE monitoring programmes in the annual monitoring report and make available on the council's website at www.nrc.govt.nz/soe by 31 October each year- **NOT ACHIEVED (loaded 4 weeks late).**

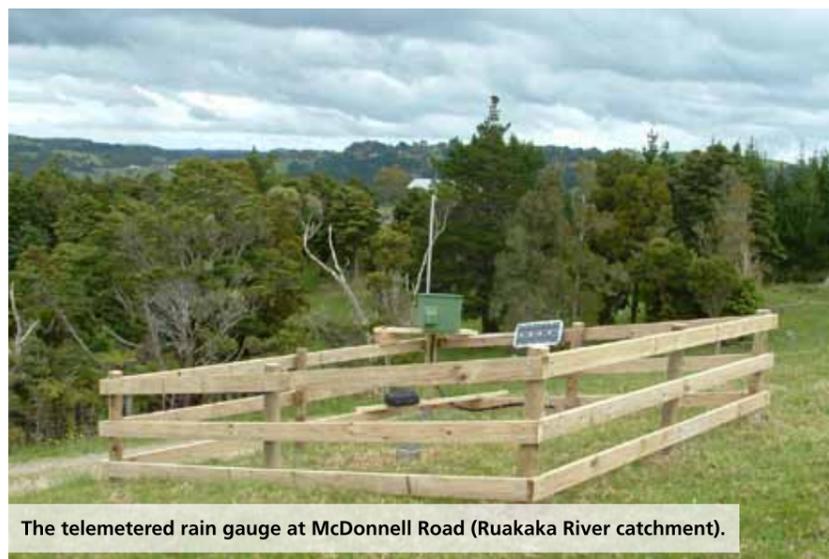
Key points 2010-2011

- Annual rainfall for Northland varied from 90 percent to 160 percent of average.
- Extreme dry conditions during mid spring to early summer.
- Central Government declared a medium level drought for Northland in December.
- Eleven severe weather warnings were issued by MetService.
- Several significant weather events including ex-tropical cyclone Wilma, damaging winds and isolated thunderstorm activity.
- Tsunami waves generated by the Japan earthquake affected coastal areas.

The Northland Regional Council monitors rainfall, river, groundwater, tidal and lake water levels through its hydrometric network, which consists of 218 monitoring stations spread across Northland. Of these stations, 87 are on a radio/cellphone telemetry network, which means that the data collected is automatically sent to the council's computers for processing.

The information gathered allows the council to make informed decisions about the region's environmental resources, as well as providing valuable information during Civil Defence emergencies, such as severe storms. It is also used to guide water management, particularly during drought conditions and to develop an improved water allocation framework for the region, which will ensure the sustainable management of Northland's freshwater resources.

All telemetered rainfall and river information is available on the council's website www.nrc.govt.nz/riversandrain



The hydrometric network

Regional council monitoring stations have been located to provide region-wide coverage. Telemetered sites provide a 'real-time' picture of the state of Northland's water resources and are particularly important during periods of extreme rainfall, updating both the public and Civil Defence on the potential for flooding, and also drought conditions.

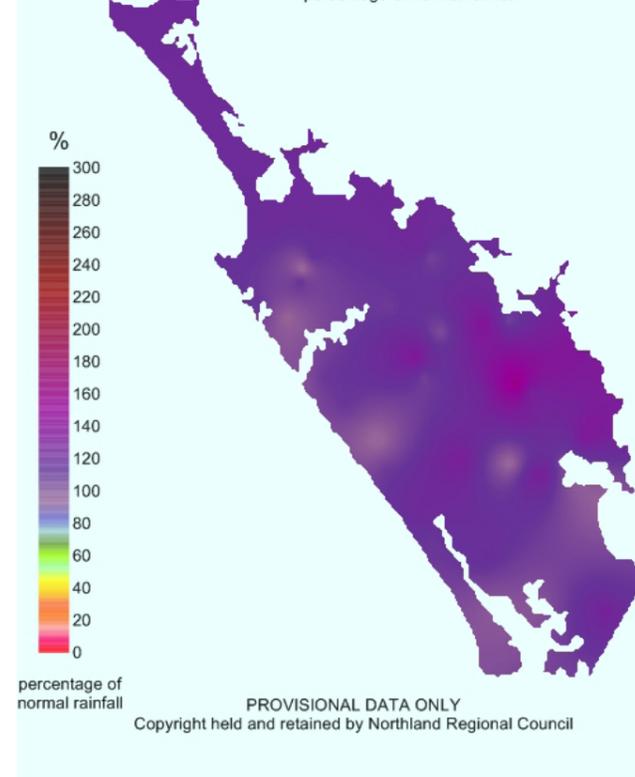
The network also provides important water level and flow information for the council's flood management projects. To find out where the telemetry sites are for Northland go to www.nrc.govt.nz/riversandrainfall

Rainfall

In 2010-2011, the annual rainfall for Northland varied from 90 percent to 160 percent of the mean annual rainfall for the region. More rain was recorded in eastern areas throughout the year. Generally, the region received average to above average rainfall for the year.

The map overleaf shows the annual rainfall recorded for Northland as a percentage of the mean annual rainfall.

Annual Rainfall - July 2010 to June 2011



Northland's climate in 2010-2011 was typically variable. Winter included average to above average rainfall, severe winds, heavy rain, and flooding. Mid spring to early summer saw extreme dry conditions return to the region with a medium level drought declared in early December. Late December through to late autumn had severe localised thunderstorm activity and frequent severe rainfall events.

The MetService provides regional councils with frequent warnings of adverse weather systems. During 2010-2011, eleven severe weather warnings were issued. Six of these severe weather warnings produced significant flooding in the region. Other climatic events to affect the region during the year included, an ex-tropical cyclone weather system, damaging winds, isolated thunderstorm activity and tsunami waves.

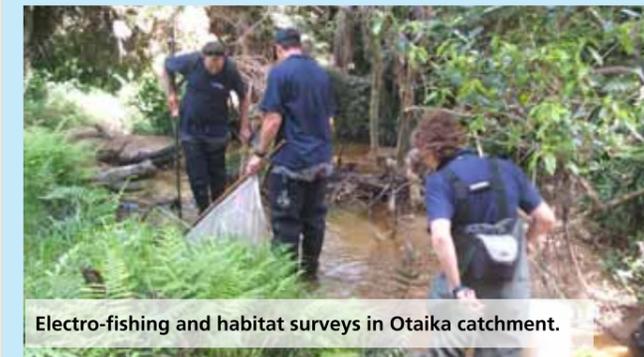
River flows

Northland has a large number of small river catchments and short, meandering streams. Climate and geology influence the flow within these rivers and the seasonal variation in rainfall is reflected in higher flows during winter and lower flows during summer.

During 2010-2011, rivers in Northland had average to above average monthly flows for nine months. As a result of severe drought conditions from October 2010 to November 2011 river flows during this period were well below average.

WATER ALLOCATION CASE STUDY: Otaika catchment

The Sustainable Water Allocation project is working to update the water allocation regime in Northland to ensure that the needs of users and the environment are protected into the future.



Key to this project is a stock-take of the water resources in the region to establish how much water is used. The Otaika catchment has been used as a pilot for this study. During 2010-2011:

- A new water level recorder was installed to collect seasonal stream flow information. Real time data will be used to manage low flow and flood events.
- A postal questionnaire was sent to all property owners in the catchment. Results from the survey provide valuable information on how much water is used, what it is used for and where it is sourced from. Results showed that 56 properties take surface water and 14 properties take groundwater as a permitted activity under the Regional Water and Soil Plan, which equates to 158m³/day and 20m³/day, respectively.
- A fish survey was undertaken to establish the types of fish that live in the catchment. Banded kokopu, torrentfish, longfin and shortfin eels, smelt and inanga were just some of the species found. The information gathered will be used to determine the river flows needed to sustain the life-supporting capacity of the water body.
- A rainfall runoff model was created to simulate historic low flows in the catchment. This model will be reassessed when actual flow records become available.

This information will enable us to provide feedback for policy development, consent processing and to the community on the state of Northland's water resource.



The next steps include reviewing groundwater and surface water interaction in the upper catchment and determining if the processes used in this case study can be applied to other catchments.

Torrentfish.

Drought 2010/2011

From November 2009 to May 2010, Northland experienced a severe drought with rainfall amounts the lowest in the last 80 to 115 years. River flows were also the lowest in 40 to 50 years. As a result the economic, social and environmental impacts were severe and widespread.

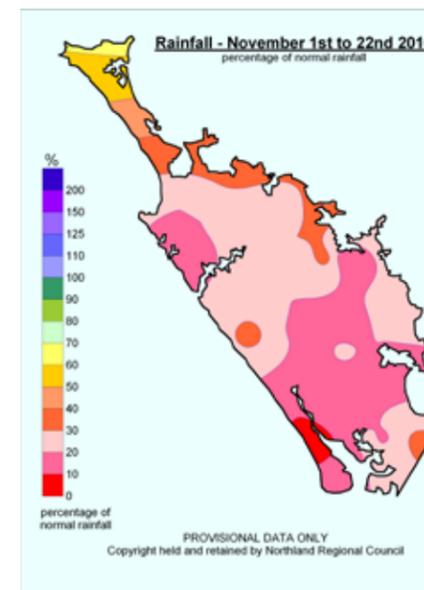
By the time the drought had 'broken' in May 2010, the regional rainfall deficit over the six months from November 2009 to May 2010 was 400mm. For the region's water resources to recover and to prevent severe drought conditions from re-occurring in 2010/2011, normal to above normal rainfall was required over the winter and spring months of 2010.

Drought progression

Rainfall during winter and spring of 2010 was quite variable. Generally, near normal to above normal conditions prevailed throughout winter. By early spring a moderate La Niña weather pattern was well-established in the tropical Pacific, and average to above average rainfall was expected until autumn 2011.

Despite this prediction, spring remained dry, with October and November rainfall amounts well below normal. Farmers were still recovering from last summer's drought and were now facing similar conditions.

Soil moisture deficits and river flows were lower than at the same time in 2009, while ground water levels in the major aquifers such as Aupōuri, Kaikohe and Maunu were at or above the normal levels expected for that time of year.



November 2010 rainfall amounts.

River flows were expected to reach their five year drought low flows by early January 2011. The government once again declared a medium level drought zone for the whole of Northland in early December 2010.

The Northland Regional Council issued more than 600 letters to consent holders, large industries taking water from bores, streams and lakes. These advised of potential water shortages and restrictions and the need to conserve water and plan for alternative supplies. Roading contractors were also advised.

Ex-Tropical Cyclone Wilma 28-29 January 2011

On 27 January 2011 the New Zealand Meteorological forecasters issued a severe rain warning for Northland as the remnants of ex-Tropical Cyclone Wilma approached the region.

Rainfall amounts were predicted to be from 100mm to 150mm, but reaching up to 200mm about the eastern hills over a period of 21 hours. Northland was to take the full impact of this weather system

The council issued media releases, warning Northlanders of the potential for widespread flooding and strong winds.

Rainfall amounts exceeded those predicted by the MetService. Over 250mm was recorded along the eastern areas of the region from the Mangōnui Forest north of Kaeo to Mangawhai. The storm lasted 18 hours from 9am 28 January to 3am 29 January. Seventy-five percent of the total rain for this event occurred over eight hours from 4pm to midnight on 28 January. Rainfall intensities over this period were continuous at 25 to 40mm/hr.

The high rainfall amounts over a short period resulted in:

- Rapidly rising rivers and streams, elevating levels to record heights;
- Severe scouring in drains, culverts, rivers and roads;
- Widespread flooding of low lying areas, secondary roads and state highways; and
- High sediment input to estuaries and harbours.

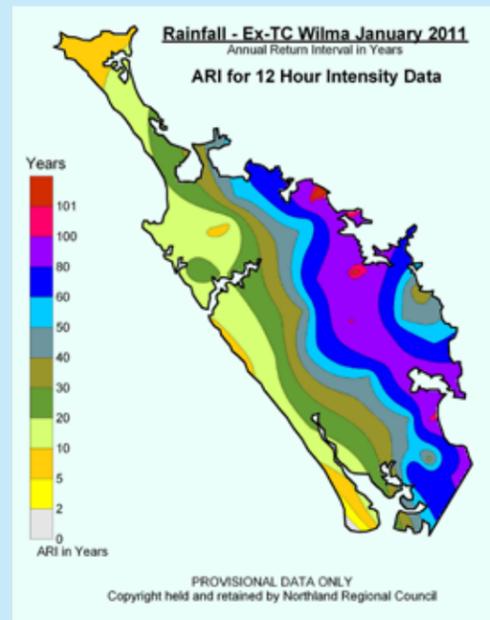
Record river levels and flows were recorded in the river catchments of the Oruru (Taipā), Kaeo, Waitangi (Kerikeri), Kawakawa, Wairua, Mangakāhia, Whāngārei central business district and Ruakaka.

Impacts of the cyclone:

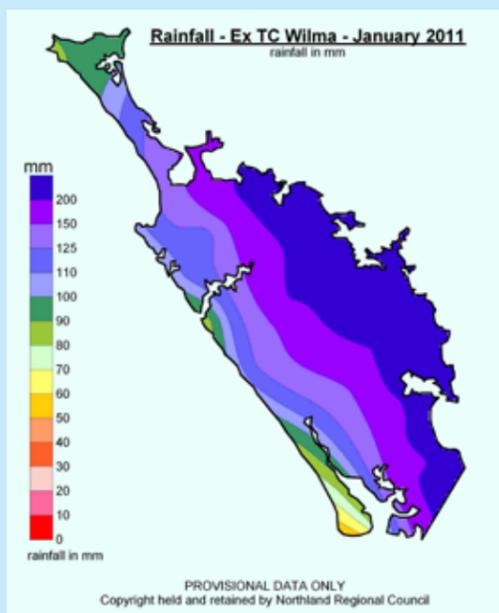
- Damage to infrastructure such as roading, sewerage and water supply systems in Whāngārei and Far North districts;
- Flood damage to homes, contents and personal possessions;
- Impact on business and facilities; and
- Damage to pasture, fences, culverts, drains etc, but low stock losses.



State Highway One flooded at Moerewa.



Return periods (years) rainfall intensities for 12-hour duration.



Cyclone Wilma total rainfall amounts (mm).

Civil Defence Emergency Management response:

- Emergency services, Northland Regional Council, Far North, Whāngārei, and Kaipara district councils and the Welfare Advisory Group implemented response plans.
- There were a significant number of high risk incidents and some rescues however there was no loss of life.
- The combination of a holiday weekend (people away) and the nature and scale (during the night – quick river rises – larger event than anticipated) meant most responding organisations were stretched.
- Large number of road closures.

Rivers in the Far North and western areas were the most effected. Many irrigators had to stop taking water from rivers because the levels were so low. Water conservation messages were distributed in the Far North and Kaipara districts. The Far North District Council put water restrictions in place. There was no requirement for water shortage directions to be issued during this period.



Drought flows in Wairua River.

Drought management

Management was the same as for the previous year's drought. For more information visit www.nrc.govt.nz/amr.

The Northland Drought Committee was re-established in December. The committee provided advice and support to farming families affected by the drought. Rainfall, groundwater and river levels were regularly reported to all major water users.

District councils were responsible for public water supply, demand management and water conservation strategies.

Drought 'broken'

The drought was 'broken' when significant rain fell during the last week of January 2011 as the result of an ex-tropical cyclone moved into Northland bringing widespread rain.

Impacts on Northland

The effects of the drought were again severe and the impacts included:

- Production loss from dairy and livestock farming;
- Poor pasture cover, stock feed shortages;
- Poor condition of stock and animal health problems;
- Water supply shortages - rural, urban and irrigation;
- Stress, health and welfare;
- Financial losses and hardship;
- Extreme fire risk; and
- Environmental and ecological stress.