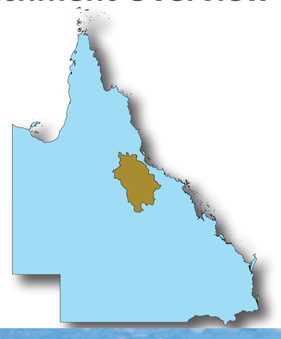
Charters Towers Regional Council
Local Knowledge Map

Resilient Queensland
Queensland Reconstruction Authority

QUEENSLAND GOVERNMENT

Catchment Overview



The Charters Towers Local Government area (LGA) encompasses six sub-catchments being the Belyando, Cape Campaspe, Haughton, Lower Burdekin, Upper Burdekin and the Suttor. The headwaters of the Cape, Campaspe and Haughton Rivers are located in Charters Towers and all have similar flow behaviours with water transversing to the east. Segments from both the Belyando and Suttor River sub-catchments are closely situated along the south-east boundaries of the LGA, while the Upper and Lower Burdekin sub-catchment spans from the north-east quadrant of the LGA before passing through the LGA in the east. Each of these systems eventually drain into the Great Barrier Reef Marine Park and are remarkably responsive to rainfall and flood events.
Major towns situated the Upper Burdekin include Greenvale and Charters Towers which are not situated near a major system. In the Cape Campaspe sub-catchment, Pentland is situated near a range of tributaries which flow into the Cape River, and Ravenswood is the only major regional town in the Lower Burdekin sub-catchment. There are no major towns identified in the Belyando, Haughton, and Suttor sub-catchment sections of the Charters Towers LGA.

Climate & Rainfall

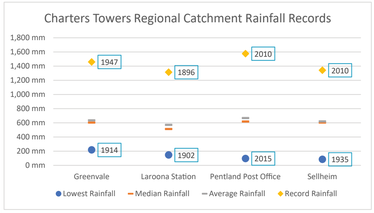
Weather and climate characteristics in the Charters Towers Regional catchments in the last 30 years (1989 - 2018):

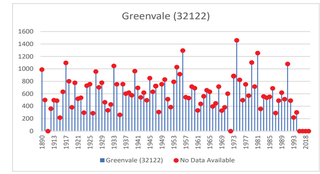
The catchment is very responsive to rainfall from coastal influences, monsoons, tropical cyclones and depressions.

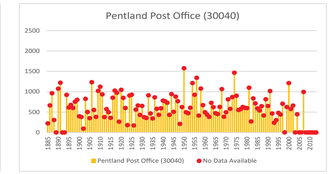
Annual rainfall has been relatively stable, however growing season rainfall averages have decreased.

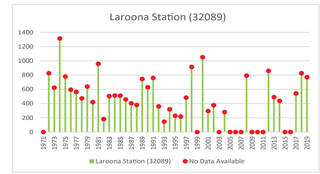
In the last 30 years (1989-2018), dry years have occurred 12 times and wet years have occurred 12 times. The three-monthly rainfall totals leading into the dry season have increased slightly with annual rainfall being relatively stable.

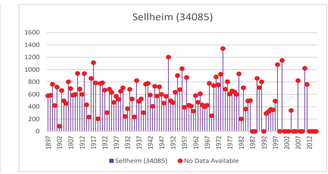
The hydrological seasonality associated with wet and dry season flow conditions are critical to ecological charter, function and associated values of aquatic ecosystems. While these patterns provide the overarching driver for the system, on floodplains, the altered flow regimes associated with functioning of the dam and irrigation system are the drivers of impacts such as reduced water quality, weed infestation and barriers to fish passage.

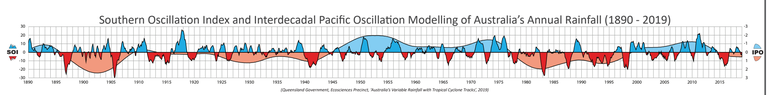




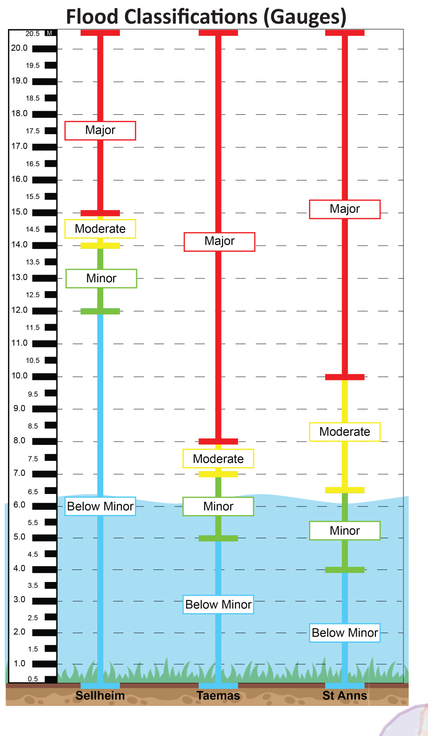








Charters Towers BoM Flood Classifications (Gauges)



General Landscape Knowledge

Water movement in the Lower Burdekin area has been substantially altered by the Burdekin Falls Dam and irrigation for cane farming. The altered flow regimes are drivers of impacts such as reduced water quality, weed infestation and barriers to fish passage.

Feral pigs are a concern in the northern part of the Burdekin Catchment. They are deforesting creek banks and sometimes creek beds. This increases the velocity of flows and scouring.

The Eastern side of the catchment is much steeper and there is increased flows as a result.

There is a lot of groundwater movement in the Burdekin and Haughton catchments. Often half the Burdekin can be flooding while the Haughton is not and vis versa.

Alluvium concentrations can often indicate that there will be sandy deposits along water systems. The bathymetery of the Burdekin upstream of the weir changed significantly after the 2019 event. It moved a lot of sand and sediment downstream. If a system has a rocky bottom and the sediment has been washed out, this often indicates that the system is fast flowing.

There are a lot of fault lines in the catchment. The fault lines will not follow a linear direction and will often change direction. There are several rivers in the catchment which may have been formed from these fault lines. The underlying geological structures control and influence the landscape greatly.

Basalt geologies contribute to the resilience of the catchment as they recharge the system. Where water will often run off other geologies, Basalt will act as a sponge by soaking up the water and also assists with providing a continuous flow of water for a system. There is however little evidence that Basalt will feed water into the underground water tables. It is also important to note that the different layers of Basalt across the catchment may differ in retaining water. One layer may be really good at it, while the next layer may be the opposite. Water will often come above ground where Basalt geologies meet alluvium or other geologies.

There are a lot of gullies in the catchment due to the erosion of the different geologies. Granite and Basalt can be quite erosive. The hills and lowlands on granitic rock geology will often contain tin.

Lake Lucy will fill during the wet season, however it will be dry during the remainder of the year. The lake has high value wetlands.

There has been two large floods which have backed up in this area. The Burdekin River holds up flood waters.

The channel here varies in size and is very refined. There are fast flows here due to the geology.

Water will run to the surrounding waterholes here.

The main damage / impact from TC Yasi (2011) in this part of the catchment was caused from cyclonic wind.

There are old mines here with tailing dams still intact. There will be future challenges if these old mines are not well maintained or rehabilitated.

The Basalt here is between 200-300m deep.

Poison Lake is poisonous due to the metamorphic geology around and under the lake. The lake does have good quality water when it is full, but becomes toxic when it dries. Not good drinking water for cattle.

There is volcanic geology at the top of the catchment with lots of springs and the water can be trapped by basalts.

There are a lot of different crops and diverse agricultural practices being trialled around Mt Fox.

Douglas Creek comes from Mt Fox. The topography is steep and the water flows hard and fast. It also has a lot of water, but not like the Star River and Keelbottom Creek. The creek also has the characteristics of a river. It has a hard geology with springs that feed the creek.

There is high rainfall on the eastern side of the catchment which is dominated in monsoonal season.

The whole system here dries out really quickly.

Oaky Creek is dry and has a sandy creek bed.

Water travelling down from Greenvale is red mud water. Most other rivers flow clear water.

Greenvale

This is a constriction point with a large gorge.

Landholder around Kangaroo Hills perceive the water taken from the hills to be of a higher quality than the Burdekin River.

Star River is very quick rising with steep and fast run-off. It also has a large impact on the Burdekin, especially if both are up.

The headwaters for the Star River is broad and is a location with a high amount of rainfall to input into the system. It is a flash flood event which doesn't flood a lot, but when it does, the river runs fast. There are also few constrictions along the Star River.

Anabranches on Blue Range Station.

There are three bridges north of Greenvale which impede access to the Greenvale during an event due to their height.

The Valley of Lagoons will hold back flood waters as the lakes fill before flood water flow down before meeting at the Basalt junction. The area is a high value area with permanent, and a rare wetland system.

There is very fast flowing water at Hidden Valley. The spilling of Palumpa Dam is a main issue, however the community is very resilient.

Ewan

The Star River was larger than the Burdekin River during the 1991 and 1998 event.

The Star River is relatively more of a sandy system than the Running Creek.

Ouring the wet season, the Star River will discharge approximately 200 megalitres monthly. It is estimated that 10-15% of flood waters will come from the Star River.

The Gorge along Gray and Porphyry Creeks holds back water in the Burdekin so it levels out the Burdekin flood level after a few days.

Flooding can cause closure of the low-level bridge on Gregory Developmental Road seven days.

There is severe erosion where the Clarke River merges with the Burdekin.

Running River is very steep and fast flowing. The system is refined with no alluvium and a lot of deep waterpools.

A layer of white sand has been deposited from far upstream indicates a high velocity flow. The banks conditions after the 2019 event worsened.

There is a fault line along Gray Creek.

Gray Creek is generally dry, but is fast flowing.

There are thousands of scours and gullies in this whole area.

Keelbottom Creek catches a large catchment area on the western side of the range. The creek will have clear water during an average run and has very fast flows without a flood. It is not permanently running system as there are not basalts present. The bottom of the creek is sandy and pebbly as there are a lot of sandy tributaries which feed into the system.

Gray Creek has a big impact on the area.

The Clarke River does not flow permanently and there are a lot of deep holes around here.

Motorists have been isolated from Hann Creek during previous events.

There are permanent waterholes all the way down the Burdekin River which makes the river appear to be permanently running. The granite geology of the river makes it an environment highly prone to flash flooding.

The average monthly discharge for Keelbottom Creek is approximately 400 megalitres during the wet season. This contributes a quarter of the water level gauged at Sellheim.

This is a very hilly area with a lot of springs.

The 2019 flood event exposed infrastructure underground that had been buried for 20 years.

Flash flood possibility along Hervey Range Road at Star and Keelbottom Creek Crossing where people could be stranded.

Upper Burdekin River Catchment

The bedrock has created permanent pools along Broken River.

This side of the catchment does not receive that much rainfall compared to the otherside of the catchment.

There is fast runoff in this area.

Keelbottom Creek can be backed up and flow upstream during a flood event or with a lot of rain.

Leachate from old mines may infiltrate water in the Fanning River.

The Fanning River rose to the highest height in living memory during the 2009 flood event. The flood waters went over the cabins situated nearby.

This is a recharge area.

Sandy Creek will run a reddish colour.

There are very large uranium deposits in this area and is considered to be one of the largest in the world. The license to extract it was not approved. Uranium is also said to be leaking into the surrounding system and has contaminated the water from exploration activities or from natural leakage.

In a flood event, most of the rainfall comes off the steep country in this area and down from the Star River and Keelbottom Creek.

Do not swim across Clarke River. It is too fast and turbulent.

Fletcher Vale has a Telecommunication tower but no mobile coverage. This has affected communication of which routes are open.

The Fanning gets backed up when there is a lot of water coming down the Burdekin.

This area can receive a lot of rain.

There are a lot of springs situated along Maryvale Creek which makes the creek look like it is running.

Basalt River starts to become a lot more sandy along this area of the river.

Flood impacts at Big Rock Weir, or from Big Rocks Weir project, to increase horticulture production in the area.

The area where the Allingham, Fletcher and Lolworth Creed merge turns into a floodplain when the water is running.

The system here has a consistent flow and steady water height. The area is also highly susceptible to flooding and cyclones from the west.

This is a large recharge area.

There are a lot of springs in this area. There are strong and constant flows here as well.

The impacts from the 2002 flood event were felt through Toomba Station and on the southern side of the Basalt Creek. Station owners were required to chain down assets and had no warning.

Gainsford is a key location for BoM to forecast heights at Sellheim / Macrossan Bridge.

Lolworth Creek was flowing over the Basalt like a waterfall into the floodplain during the 2019 event after the rain stopped falling.

There are limestone caves in this area.

Station Creek is usually an underground water flow, but in 2019 experienced significant surface flooding. Spear pumps were used.

Water in this area will flow east.

A lot of fossils found around Echo Hole. The area used to be volcanic and it has a complex vegetation zone with a lot of irrigation.

Haughton River Catchment

Different geologies in Keelbottom Creek from other creeks, particularly Basalt River.

Blacksoil country with feed grass country around Eumara Springs.

The landscape is inverted here. It is a bizarre system. There is also a lot of water and recharge springs concentrated here.

Station Creek does not flow all year.

The Fanning River system is about half the size of the Keelbottom Creek system. The Fanning is also fast flowing.

Toomba Lake will first turn into an inland lake and then into a wetland after a substantial flow.

The Gregory Developmental Road was cut off during the 2002 flood event by both Hann and Lolworth Creeks. The Hann spread debris over the area and road.

The Basalt here is 100m deep.

The Hann Creek does not run fast. The creek has steep banks and a sandy bottom. It can be backed up and will receive water every wet season.

Charters Towers

Ravenswood

Flat country here and was where a strong flood event took place in 2002. The event shifted 2-3m deep of land several kilometres downstream and deposited sand on ridges. There was an enormous amount of rain here during this event. There were places and stations that have never seen water at the bottom of houses before and people needed to be rescued off roofs.

The soil is of relatively poor quality in this area.

This area is flood susceptible.

Homestead Creek runs fast and the area is quite hilly.

Headwaters of Cape River is very hilly.

Large portions of the train line were lost due to flash flooding in 2009 and 2010 which were rebuilt with improved culvert drainage. The area coming into Homestead is low-lying.

Localised rain can turn this area into an inland sea which comes up and down quickly from Balfe Creek westwards.

Houses which directly back onto Betts Creek are susceptible to inundation.

Mount Stuart has a homestead which has serious runoff.

Pentland

This area is Basalt country. It is hilly and mountainous with fast run-off.

The Flinders Highway is a vitally important transport link.

Lower Burdekin Catchment

Gregory Development Road is slightly prone to flooding, causing road closures when the Campaspe River is running high. The 2019 event saw little water lapping the road.

Burdekin Dam is claimed to have the most reliable flow in Australia.

Coal seams exist between Pentland and Hughenden.

Cape Campaspe River Catchment

The 2m causeway upgrade of Cape River bridge mostly mitigates flood closures.

Betts Creek flooded around 2019 and five houses were inundated.

Houses were inundated during the 2009 Creek Street flooding.

The Cape River Bridge has remained open during most weather events since being upgraded.

This area is highly drought prone.

TC Debbie (2017) had little impact in this area.

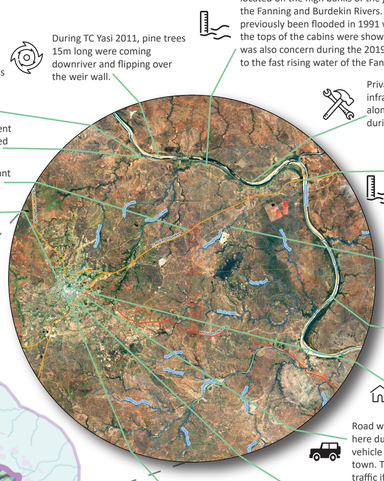
Lake Buchanan was formed through movement of the earths crust and is an internally draining system. The lake is a good example of a large, shallow, less than a metre deep when full, saline lake in a closed drainage basin, with surrounding relict beach structures in the Desert Upland bioregion. Waterbirds will periodically use the lake as an important habitat and refuge area.

Lake Buchanan has previously been used for grazing on native pasture and salt harvesting. Overgrazing and feral pigs are the main disturbances to the lake.

Mogga, Whistling Duck and a number of other unamed creeks drain into the lake. The lake is also a freshwater lake that increasingly becomes more saline as it dries out with seasonal rains falling mainly between December-March.

Suttor River Catchment

Belyando River Catchment



If there is 7m of water at the weir, the Macrossan Bridge is at danger of being closed. Low lying areas can cut off access to the Weir. Lavaraks and Sheep Station Creeks can flow rapidly at times. Boats were once used to cross the creeks.

During TC Yasi 2011, pine trees 15m long were coming downriver and flipping over the weir wall.

Bivouac junction cabins and camping area is located on the high banks of the junction of the Fanning and Burdekin Rivers. It has previously been flooded in 1991 where only the tops of the cabins were showing. There was also concern during the 2019 event due to the fast rising water of the Fanning River.

Private water pumping infrastructure at properties along the river were destroyed during the 2019 event.

The weir has water treatment infrastructure which is raised above the flood height.

Vitally important transport link.

Flash flooding on Macrossan Creek.

In 2019, the Macrossan Bridge was inundated when the river was 5.5m at the weir. This was because the Fanning River was flowing so fast that it joined with the Burdekin River. Usually the bridge is inundated when the river height is 6.5m or 7m at the weir.

Fletcher and Moonlight Creeks can flow with the moon cycles presumably effectively due to the proximity of springs to the surface. The Fletcher can run even without rain.

Anecdotal evidence of flow rates of approximately 40km/h along the Burdekin River during the 2019 event.

There are no houses below flood level in Charters Towers. Floods are quite manageable.

Road width and height is restricted here due to the rail corridor so heavy vehicle traffic is diverted through the town. This can cause delays for diverted traffic if waiting for a long train.

During TC Yasi 2011, water that quickly came up was only 1m under the 1946 levels. Instead of three days warning, Charters Towers only had 18hrs warning.

In 2008, the CBD flash flooding was caused by the low pressure system over Charters Towers that produced an estimated 25.4cm over 24hrs and drained quickly. The system is generally quick draining during flash floods.

Handy Catchment Tips

Where floods occur in succession, the second flood will travel slower due to vegetation that has grown from the first flood. The second flood will often flow clearer, because of the vegetation filtering more sediment out and slowing water flow.

Flood travel times are dependent on many different variables. These include when and where the water hits the catchment, how wet the catchment was beforehand, whether there is vegetation in the catchment, recent modifications to the channels and throughout at the catchment, and water flowing in from other places.

Alternating rainfall which contribute to flood events will often deposit large concentrations of sand and silt. Large sand deposits are often located further away from deep water.

Vegetation plays an important role in slowing water movement across the landscape which not only helps retain surface water, but also reduces the potential for erosion to occur and reduced the associated issues with water quality and sedimentation further downstream. Reducing flow speed of runoff also plays an important role in protecting banks and part of the landscape prone to gully and rill erosion.

Monitor the Sellheim gauge to determine what is happening downstream. Big rain events are also usually part of larger and longer term systems

Where there are more Eucalypt trees, there will be less grass and an increase of flow velocity. Revegetation of Eucalypt trees needs to be more closely managed. The tannins in the trees will kill the grass below them.

Braided grass is a weed which is often transferred onto properties by slashing activities along the roadside. Sian weed is also a noxious weed to livestock and is three times more invasive than Lantana. It usually travels through water movement.

Weeds will often grow more quickly when the water is clear as opposed to when there is a lot of sediment.

Flood water colour can often determine where it has come from. Red mud comes from Greenvale Country; clear water will come from either the Star River or Fanning River; and lime coloured water comes from Basalt Country.

The clearing of debris from tributaries can enhance the flow of water down the catchment. If debris is retained, this can mitigate fast flows and stop flooding.

With the absence of alluvium, there is not a lot of land which can be successfully used for agricultural purposes.

The Upper Burdekin sub-catchment has more basalt than the other sub-catchments across the Burdekin catchment.

Alluvium concentration can often indicate sandy deposits along a system. Where a system also has a rocky creek or river bed can indicate that the system is fast flowing and has washed the sediment out.

Legend

- Tidal flats and beaches
- Coastal dunes
- Alluvial river and creek flats
- Clay plains
- Old loamy and sandy plains
- Inland dunefields
- Ironstone jump-ups
- Basalt plains and hills
- Undulating country on fine grained sedimentary rocks
- Consolidated sediments
- Sandstone ranges
- Hills and lowlands on metamorphic rocks
- Hills and lowlands on granitic rocks
- Manual Gauge
- Automatic Gauge
- Stock Route
- Cat D Proposed Gauges
- Mountains
- Flood related information
- Agriculture/Feed information
- Vegetation related information
- Pinpoint between locations
- Community related information
- Water related information
- Fire related information
- Infrastructure related information
- Climate related information
- Road and Transport related information
- Mining related information
- Severe storm/weather related information
- Property related information
- Topography related information
- Towns
- Mines
- State Controlled Roads
- Local Roads
- Train Line
- Tropical Cyclone/Cyclonic related weather

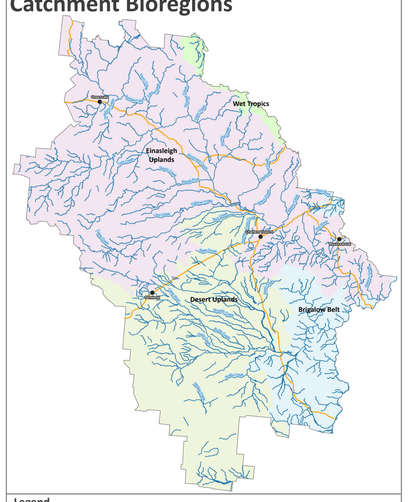
Tips for Graziers

Agriculture practices influence the sediment in waterholes and the water infiltration in the area. Sediment can also impact groundwater infiltration. Cattle and water are also mainly responsible for the spread of weeds and seeds.

The average ground water level is 3m below crops. Crops will be affected when the ground water rises to 2m below the crop as this can increase salinity in the soil.

Farmers along the Burdekin River will try not to disrupt the soil from December to April as this may cause erosion.

Charters Towers Regional Catchment Bioregions



General Risk Awareness Information

The 1991 flood season was unique as floodwaters stemmed from every part of the catchment which was responsive to any significant rainfall due to the persistent presence of a monsoonal trough lasting two months.

BoM predicts a 12hr warning from Gainsford for Macrossan Bridge. Council uses 6hrs for water operations at the weir, given input from Keelbottom Creek and Fanning River.

The 2002 flood was generated from a significant amount of rain at the headwaters of Lolworth and Hann Creeks. It came through very quickly and the flood waters reached places and stations which have never seen water at the bottom of houses during the event. People living the area had to be rescued off roofs.

Crossings along Hann Creek, Basalt River and Clarke River were closed for over three weeks in 2019. The bridges situated along these systems are relatively low.

During a flood event, the gravel road network becomes an accessibility and economic issue across the Charters Towers Local Government Area. The network is also susceptible during a tropical cyclone.

Big Rocks Weir is below the junction of Keelbottom Weir. It is intended to be used for instream storage, but it will direct water else where.

If there is an electricity outage during an event, mobile connectivity may be impacted for a period of time if telecommunication towers do not have reserve power measures in place. Generally, telecommunication towers will have a 12 hour reserve power supply. Some will automatically switch over if external power is disconnected; others may need to be started manually. Events in other parts of the state can also impact and affect the telecommunication network.

Mining remediation is an ongoing challenge in the catchment and contaminants in flood waters from abandoned mines are an issue for primary producers. There is a connection between flooding and mining leachate overflow.

In 2011, TC Yasi caused extensive flooding which was only 1m under the 1946 event and there was only 18 hours warning instead of the usual three days warning. The wind was also very damaging and may have caused more damage than flood waters. Charters Towers had a similar experience to Townsville during this event.

Freight transport will usually travel to the western side of the state when the main roads in Charters Towers have been inundated from floods. This will often damage transported goods as the roads can be rough.

Low areas can cut off access to the Charters Towers Weir. Lavaraks and Sheep Station Creeks can have rapid flow times. Boats have been required to cross these creeks in the past.

The geologies in the northern quadrant of the catchment make the area highly susceptible to flash flooding.

The Burdekin River basin is capable of producing severe flooding conditions following heavy rainfall causing inundation of properties and closure of main roads both upstream and downstream of Lake Dalrymple.

Flood events generally follow heavy rainfall with most common floods occurring in February and March. Very large floods generally occur between January and April, and significant events occurring from December till July.

Map Authors: