

= Cyclone Joy =

Severe Tropical Cyclone Joy struck Australia in late 1990 , causing the third highest floods on record in Rockhampton , Queensland . This cyclone began as a weak tropical low near the Solomon Islands , and initially moved westward . On 18 December , it was named Joy , becoming the 2nd named storm of the 1990 ? 91 Australian region cyclone season . After turning southwest , Joy developed a well @-@ defined eye and strengthened to maximum sustained winds of 165 km / h (103 mph) while approaching Cairns in Far North Queensland . Brushing the city with strong winds , the cyclone soon weakened and turned southeast . Joy later curved back southwest , making landfall near Townsville , Queensland on 26 December . It dissipated the next day ; remnant moisture continued as torrential rainfall over Queensland for two weeks .

While drifting offshore northeastern Australia , the cyclone produced wind gusts as high as 124 km / h (77 mph) in Cairns , strong enough to cause power outages . In Mackay , a tornado spawned by Joy damaged 40 homes , while torrential rainfall just south of the city peaked at over 2 metres (6 @.@ 6 ft) . Most storm @-@ associated damage was wrought by severe flooding , which persisted for weeks in hardest @-@ hit locations . Rains significantly increased water levels on 10 rivers , among them the Fitzroy River , which discharged about 18 trillion litres (4 @.@ 8 × 10¹² US gallons) of freshwater into Keppel Bay over 25 days . In turn , the Great Barrier Reef suffered biological damage from coral bleaching and decreased salinity . The Fitzroy River rose to a 9 @.@ 30 @-@ metre (30 @.@ 5 ft) peak at Rockhampton , forcing thousands to evacuate homes ; some stranded individuals could only obtain food by helicopter . Elsewhere in Australia , storm moisture alleviated drought conditions and diminished fires near Sydney . Overall , Joy killed six people and caused A \$ 300 million in damage (\$ 234 million USD) . Afterwards , the Queensland government issued a disaster declaration for about 30 % of the state , and the name Joy was retired from the list of tropical cyclone names .

= = Meteorological history = =

In mid @-@ December , a monsoon trough persisted along the west Pacific Ocean , spawning a pair of tropical disturbances both north and south of the equator . In the northwestern Pacific Ocean , the system became Typhoon Russ . On 15 December , a tropical low formed east of the Solomon Islands . During the next few days , the system passed south of the country while slowly organizing . On 18 December , the Australia Bureau of Meteorology began tracking it , naming the system " Joy " after it upgraded the low to tropical cyclone status . A meteorologist from Darwin later apologised that the name was used so close to Christmas , although " Joy " was predetermined by a rotating list of list of tropical cyclone names . Also on 18 December , the Joint Typhoon Warning Center (JTWC) began issuing warnings on the storm , labeling it as Tropical Cyclone 06P . With a ridge to the south , Joy continued generally west @-@ southwestward .

While in its origins , Joy was experiencing upper @-@ level wind shear , but as it approached the jet stream while turning to the southwest , conditions became more favourable for intensification . The storm quickly intensified , reaching the equivalent of a minimal hurricane on 21 December . At 00 : 00 UTC on 23 December , the Bureau estimated Joy reached peak 10 @-@ minute sustained winds of 165 km / h (103 mph) , which made the system a category 4 severe tropical cyclone on the Australian tropical cyclone intensity scale . Around the same time , the JTWC also estimated the same peak winds , but sustained over one minute . Joy developed an eye about 50 km (31 mi) in diameter with concentric eyewalls . The storm began moving slowly off the northeast coast of Australia , passing within 100 km (62 mi) of Cairns , and the motion shifted to a southeast drift . A building high pressure area to the south caused the change in movement , and there were initial concerns the storm would loop to the west and affect Cairns again . Drier air caused Joy to weaken gradually from its peak to the equivalent of a strong tropical storm . At 06 : 00 UTC on 26 December , after turning back to the southwest , the storm made landfall near Townsville , Queensland , with winds estimated at 95 km / h (59 mph) . That day , the JTWC discontinued advisories , and on 27 December , Joy dissipated inland over Queensland . A remnant system persisted into early January

, producing continued rainfall across Queensland .

= = Preparations = =

Before Joy struck Australia , residents evacuated from resorts on Fitzroy and Green islands by boat or plane . Officials set up evacuation centres on the mainland and put the Australian Army on standby . The military evacuated its fleet of Blackhawk helicopters inland from RAAF Base Townsville . A man required rescue from Hope Island by helicopter in advance of the storm . The threat of the storm caused shopping malls and the airport near Cairns to close just before Christmas . Several flights were diverted or delayed , stranding about 1 @, @ 000 travellers , many of whom spent Christmas in the airport . Road travel was banned in some areas of northeastern Queensland , and residents in Port Douglas were forced to evacuate . The Flood Warning Centre in Brisbane issued 192 flood warnings related to Cyclone Joy in December and January , beginning on 23 December . Most of the warnings were related to increased water levels along rivers .

= = Impact = =

Joy passed within 80 km (50 mi) of Green Island off the coast of Queensland , generating a wind gust of 180 km / h (110 mph) . Heavy damage occurred on other islands , and one person drowned while surfing in Mackay . A boat became disabled during the storm , forcing its four occupants to ride out the storm for four days on Cockermouth Island until they were rescued by helicopter . Several boats were damaged in the Whitsunday Islands .

The storm and its remnants dropped heavy rainfall throughout Queensland for about two weeks , totaling over 2 m (6 @. @ 6 ft) south of Mackay and over 1 m (3 @. @ 3 ft) between Bowen and St. Lawrence . The highest daily total was 458 mm (18 @. @ 0 in) about 30 km (19 mi) west of Sarina . Three day rainfall totals around when Joy made landfall included 831 mm (32 @. @ 7 in) in Blue Mountain and 506 mm (19 @. @ 9 in) in Waitara . Rainfall continued through the region through March 1991 , resulting in the third largest flood in the region in over 100 years .

Overall , Cyclone Joy killed six people , including five in river flooding , and caused about A \$ 300 million in damage (\$ 234 million USD) . While stalling off the northeast Australia coast , Joy produced widespread gale force winds , with gusts to 124 km / h (77 mph) recorded at Cairns . After the winds knocked over trees , causing power and phone outages , storm damage cut the water supply and briefly isolated Cairns due to debris blocking roads . An outer rainband struck Mackay as the storm moved ashore , spawning a tornado that damaged 40 houses , destroyed two others , and damaged a caravan park . The windstorm was unexpected there , and damage in Mackay was estimated at A \$ 10 million . Flooding from rainfall affected about 90 % of the city , which restricted train travel , causing three trains to be canceled and stranding hundreds of travelers . In Port Douglas , Joy produced an inconsequential storm surge of 0 @. @ 5 m (1 @. @ 6 ft) . In Innisfail , the cyclone ruined 90 % of the town 's crops , and over 20 houses sustained wind damage . Banana farmers in the Cairns region lost a combined total of 1 @. @ 2 million bunches of the fruit . Collectively , crop damage totalled over A \$ 70 million , mostly to sugar cane and banana . About 30 @, @ 000 head of livestock were killed in the region .

Rain from Cyclone Joy caused rampant flooding across the region , significantly raising water levels along 10 rivers . The Fitzroy River alone swelled to inundate about 4 @, @ 000 km² (1 @, @ 500 sq mi) of terrain . Heightened discharge caused extensive erosion along river channels that removed about 18 million tonnes (20 @, @ 000 @, @ 000 short tons) of soil and vegetation . In late December , the Pioneer River at Mackay peaked at 7 @. @ 6 m (25 ft) , safely within the confines of its levee system . The town of Giru endured flooding of streets and houses , which would reoccur several times through February . High water levels along the Tully River flooded a portion of the Bruce Highway . In the second week of January , the Herbert River peaked at 11 @. @ 32 m (37 @. @ 1 ft) , causing residential flooding in Ingham . Elsewhere in Australia , moisture from the storm eased ongoing bushfires near Sydney .

At Rockhampton , the Fitzroy River rose to an initial peak of 9 @. @ 15 m (30 @. @ 0 ft) ,

temporarily dropped , and rose to a final peak of 9 @. @ 30 m (30 @. @ 5 ft) in early January 1991 , the third highest since records began in 1860 , after floods in 1918 and 1954 . Inflow from several tributaries ensured the Fitzroy River near Rockhampton remained over 8 m (26 ft) for 13 days . The river entered 350 houses in what was the city 's most damaging flood since 1954 . The town was isolated for about three weeks after flooding covered roads , railways , and the airport . Before the worst of the flooding , Acting Premier Tom Burns declared a state of disaster for Rockhampton , giving local police the authority to force individuals living in flood zones to leave their homes . Ultimately , over 1 @, @ 000 people sought higher ground , staying mainly at the houses of friends or relatives , or at nearby schools . In an attempt to mitigate damage , 150 volunteers filled 43 @, @ 000 sandbags to protect properties . Nearby , residents rescued about 100 dogs from an affected kennel .

Storm @-@ related flooding damaged portions of the Great Barrier Reef through coral bleaching . Over 25 days , the Fitzroy River discharged about 18 trillion litres (4 @. @ 8 × 10¹² US gallons) of water into Keppel Bay , reaching the Great Barrier Reef in early January and causing a drop in salinity levels . On Great Keppel Island , about 85 % of shallow @-@ water reefs died . Reef damage also occurred in the Whitsunday Islands . The discharge from the Fitzroy River affected various islands and coral groups , depending on the offshore wind direction and ocean current . The water flow washed a group of freshwater turtles from the mainland to North West Island , though they were later returned to their native habitat . The influx of freshwater reduced commercial fishing productivity by 30 % .

= = Aftermath = =

Workers in Cairns had restored power and water supplies within a few days of Joy 's passage . After the initial flooding from Joy ended , there was additional rainfall in February 1991 that caused flooding across the region . Residual flooding cost the coal industry about A \$ 60 million due to loss of production and hindered exporting . While Rockhampton was still isolated by flooding , a helicopter airdropped food to hundreds of stranded families , after the town experienced food and water shortages . Transportation to Rockhampton was not normalised until 20 January , when the airport and incoming roads were reopened . The city of Rockhampton later created a flood plain management policy as a result of the effects from Joy . The floods helped fill the drainage basin of the Peter Faust Dam within a few weeks , speeding up a process which would have otherwise taken several years . Months after the storm , the Queensland National Parks and Wildlife Service collected reports on environmental impacts from the flooding ; they included some beneficial aspects such as new locations for animal breeding , and alleviation of drought conditions . The Queensland government upgraded a portion of the Bruce Highway near Rockhampton to reduce flooding in similar storms .

Officials declared about a third of the state of Queensland as a disaster area following Cyclone Joy , directing state funds toward recovery efforts . The Queensland government provided monetary assistance to eligible families in the disaster zone and offered special loans to farmers affected by the storm . The federal government agreed to contribute 75 % of overall relief costs . Following the cyclone 's impacts in Australia , the name Joy was later retired by the World Meteorological Organization .