



# CLIMATE & GEOGRAPHY

Fact Sheet no.11

**Topography:** Willoughby Local Government Area is located on a coastal plateau orientated southeast to northwest. The maximum height is 108.5m, dropping steeply at the eastern side towards Middle Harbour and on the western side towards Lane Cove River. The area is drained by creeks that flow through covered drains in the upper reaches opening into gullies on the east at Castlecove (Scotts Creek), Castlecrag (Sugarloaf Creek), and Northbridge (Sailors Bay Creek and Flat Rock Creek). To the west, Little Blue Gum Creek and Swain's Creek drop steeply to the Lane Cove River. The varied topography means that there is a range of microclimates fostering a wide variety native plants species.

**Macroclimate:** Willoughby experiences a subtropical coastal climate with hot humid summers and mild winters. Temperatures range from an average maximum of 26°C in January to 16°C in July. Average minimum temperatures are 18°C and 8°C respectively. The highest temperature recorded is about 45°C and lowest is 2°C. Approximately two days exceed 35°C in summer and two days below 5°C in winter. Frost occurs only in isolated pockets. The humid summer is relieved by sea breezes. Rainfall may occur in all months, the average rainfall is 1150mm per year. In March and April the median rainfall is 77mm per month and in Spring 55mm per month. Heavy rains of up to 270mm per day have occurred. Dry spells, especially in Spring and Summer, necessitate watering to maintain lush gardens. Willoughby is well ventilated with average wind velocities of 10-12km per hour. Winds are predominantly from east to northeast, except in winter when westerlies are more frequent. On most days, the winds are light at night with moderate sea breezes from the northeast in the afternoons. Sunshine varies from an average of 7.5 hours per day from October to January to 5.3 hours per day in June.

**Microclimate:** The microclimate or "climate near the ground" is significant to plant growth and can be assessed from the above macroclimate and the individual site. Vegetation, shelter, the aspect and orientation of the site to sun and wind as well as local variations of rainfall, drainage, (water and air), wind, temperature and light must all be considered. Cold and moist air can collect in pockets and strong winds deplete moisture, lower temperature and damage plants. The undulating plateau, steep gullies and cliffs as well as the varied shelter and vegetation of Willoughby gives a wide range of microclimate. They vary from warm areas, favouring tropical fruits and plants, to cool humid spots preferred by mosses and ferns. Factors affecting microclimate are the height, aspect and slope of the site. Slopes at right angles to the sun's rays (a northerly aspect) receive more radiation and are warmer than flat areas or those facing south. Light and heat can also be reflected and trapped in sheltered nooks with warmer temperatures and longer growth periods. Shelters such as buildings, trees, other communities of plants, fences and rock barriers set up microclimates that will change if any of these are displaced.

**Soils:** Soils in Willoughby are of two broad types. Firstly, clay and a clayey loam derived from shale, cover most of the shire above 90m. The other is sandy and derived from breakdown of the sandstone that underlies the shale and is exposed on the lower and more rugged west and east of the area. The extraction of clay, removal of sand, filling of gullies and building developments have changed the original soils. In general the shales produce deep fertile clayey loams, which retain water, nutrients and structure. Trees and gardens flourish in these soils as can be seen in higher parts of the area which was once the site of rainforest and market gardens. Sandstone, on the other hand, produces shallow, poor soils which are easily eroded and do not retain nutrients or water. Sandstone soils are common on the east and west edges of Willoughby City. Occasionally, small areas of nutrient-rich soil and accumulated silt from higher ground can be found in these latter areas. Parts of these areas are still in their original state.

**Geology:** The City of Willoughby lies in the Sydney Basin and is made up of eroded Triassic sedimentary rocks. The two main rock surfaces of the area are Wiannamatta shale and Hawkesbury sandstone. The surface of the flatter areas of the city consist of Ashfield shales of the Wiannamatta group, while the steeper reaches of the harbour and Lane Cove River consist mainly of Hawkesbury sandstone.



**Watercourses:** There are two main catchment areas within the Willoughby City area. The Lane Cove River Catchment is to the west, (flowing into Lane Cove River on the west; Little Blue Gum Creek and Swaines Creek) and the Middle Harbour Catchment to the east (flowing into the harbour on the east; Scotts Creek, Sugarloaf Creek, Sailors Bay Creek and Flat Rock Creek). A further twelve sub-catchments can be defined within these areas including Lane Cove River watershed, Scotts Creek catchment, Castle Cove watershed, Scotts Creek South catchment, Middle Cove watershed, Castlecrag watershed, Northbridge Park catchment, Flat Rock catchment, Moores Creek, Northbridge watershed, Sailors Bay catchment and Sugarloaf Creek catchment.

**Weather Summary:** Dry, cool westerly winds blow in winter. There are some heavy falls of rain in summer and autumn as a spin off from tropical cyclones moving south from the Coral Sea. During winter and spring some unstable south-east winds occur. Occasional strong cold south-east winds can blow throughout the year. This pattern is tempered by local conditions providing a Summer sea breeze and a Winter land breeze. The physical features of the coastal plain sandwiched between the Tasman Sea and the Blue Mountains, combined with the latitude of Sydney, result in the contrasting effects of temperate and subtropical climates and dry continental and humid maritime conditions.

Temperatures and winds in the area are usually moderate but severe storms have been recorded in the area. For example, the Naremburn cyclone in 1906 and the storms throughout the North Shore in 1986 and 1990.

**Rainfall:** Rainfall is spread throughout the year, but generally Spring has the least rainfall. Most rainfall occurs between late Summer and early Winter. Approximately 1138.7mm of rain falls annually in the city of Willoughby. November is the wettest month, with July and August having the highest number of clear days.

**Sunshine:** The mean maximum daily temperature is 22.1°C and the mean minimum is 12.2°C. The average hours of sunshine in a day is 6.8 hours. 5.3 hours in June and 7.5 hours from October to June.

**Height Above Sea Level:** The height above sea level at Chatswood Railway Station is 98.1m. The height above sea level at Artarmon Railway Station is 80.4m.

**Area:** Willoughby City Council covers an area of 22.6 sq km.

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