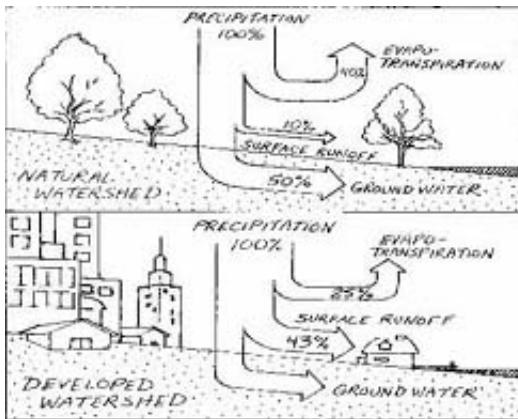


# Stormwater altered flows in the Darebin Creek

Urbanisation has greatly increased the area of impervious surfaces in the Darebin Creek Catchment. This causes rainfall that would normally slowly enter the catchment after seeping through the soil, to instead flow from the catchment quickly and in greater volumes. The increase in the rate of water entering the creek has changed the hydrology of the Creek; flood events are now more severe with an increased flow rate, causing erosion and damage to vegetation. Changes in the water flow rate also impact on sedimentation, macroinvertebrates and other river functions. Restoring the rate of water flowing into the Creek to pre-urbanisation levels would greatly improve the health of Darebin Creek.

## How do urban areas change water flow?

Urban areas are typically characterised by high amounts of impervious surface such as roads, roofs and driveways. These surfaces stop water from naturally entering the soil and recharging groundwater or slowly trickling into the creek. Additionally, lower quantities of vegetation reduce the rate of evapotranspiration that occurs. During high rainfall events, urban areas speed up the influx of water flowing from stormwater into the creek and create a higher peak flow than normal. This creates unnatural flow rates and levels in waterways, increasing the regularity of severe floods in the Creek.



The fate of rainfall in undeveloped vs. urbanised catchment (EPA, 2010)

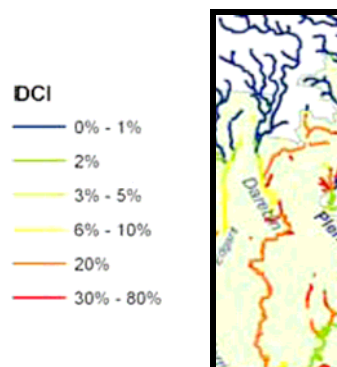
## Urbanisation in Darebin Creek Catchment

Urbanisation in the Catchment is concentrated to the lower three quarters of the creek, with the upper regions generally characterised by farmland. The peak discharge generated from an urbanised catchment can be as much as 35 times that generated from a rural catchment, with the relative difference between rural and

urban conditions being most pronounced for frequent storm events.

## The concept of connected imperviousness

Connected imperviousness (CI) is the proportion of a catchment covered by impervious surfaces directly connected to the stream by stormwater drainage pipes. The higher percentage of connected impervious area to the waterway, the greater likelihood of reduced river health such as elevated concentrations of nutrients and contaminants, altered channel form and reduced biotic richness, with increased dominance of tolerant species (Paul and Meyer, 2001). Studies have found a level less than 2% connected imperviousness is suitable to provide a healthy stream. Darebin Creek has a very high level of connected imperviousness, especially in the lower regions of the catchment.



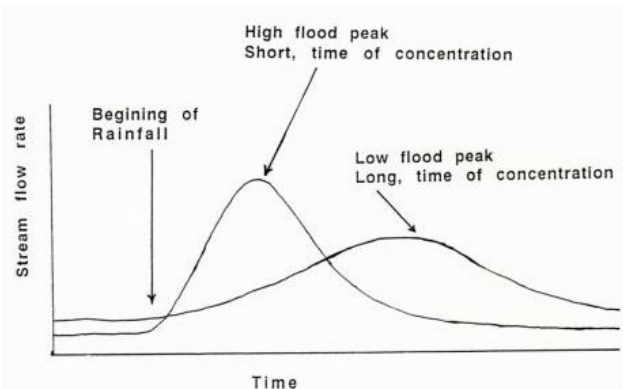
Danger and Walsh, 2008. Darebin Creek estimated directly connected surfaces

## Major impacts of urbanisation on Darebin Creek

### Changed peak flow

In pre-urbanised periods, rainfall would enter slowly and the creek would experience a low,

long flood peak. Now because of the high level of impervious surface connected to stormwater, rainfall is funnelled rapidly into Darebin Creek causing a short, high water flood peak with an increased flow rate. This can cause scouring of the streams banks, erosion and greatly alter the shape of the stream over time. As the percentage of impervious surface cover in the catchment increases beyond 10 per cent, run-off increases twofold from pre-urbanised catchments (Arnold and Gibbons, 1996). It has also been shown that there is an increase in peak flows of up to 10 times for the 3 month to 1 year ARI events (Wong et al, 2000).



Example of the change in height and rate of water inflow the in Darebin Creek.

### Decreased base flow

The reduction in water entering the creek from the soil or groundwater means there is a decrease in the level of base flows. Base flow alteration in streams has been observed to compound water chemistry problems such as increasing the variation in dissolved oxygen and temperature. Changes in flows have also altered the creek to experience continual, rather than intermittent, flows.

### Increased regularity and severity of floods

Flood events occur more regularly than during pre-urbanised periods as a higher percentage of rainfall enters the creek at a faster rate. Additionally, less rainfall is required to cause a flood event. Catchment urbanisation has led to increased frequency of bankfull discharge (when the water level fills up to the banks) from 5 years on average to 0.5 years.

### Greater influx of stormwater from smaller rainfall events

Runoff from impervious surfaces can be caused from rainfall events as low as 1-2mm. Therefore compared to runoff volumes in natural catchments, the number of runoff events into creeks increases (Ladson, 2004). Landuse changed from rural to urban can increase the number of runoff events by a factor of 20. Under forested conditions in Melbourne's East, daily rainfall of about 15mm would be required to produce runoff which would occur about 15 days a year. After development and increases in amounts of impervious surfaces, only about 1mm of rain is required to produce runoff which will now occur 120 days per year (CRC for Catchment Hydrology, 2010).

### Changed pollutant and sediment loads

Up to 70% of the pollution in streams is carried there by stormwater. Excess nutrients, such as nitrogen, washed from stormwater can cause vigorous growth of algae leading to reduced oxygen levels in the water. Changes in the levels of rainfall required to enter the creek mean there is also a variation in the level of pollutants washed in the first flush of rainfall. This means pollutants are entering the streams at a varied rate, changing how our streams cope with the nutrients. Increased flow rates additionally change sediment loads, changing the make up of the stream. The large quantities of water flowing quickly through the creek cause the banks of the stream to erode, adding sediment and causing riparian vegetation loss

### How can we reduce the effects of flow alteration in Darebin Creek?

Diverting or slowing the water flowing from the impervious surfaces on your house or business can greatly improve the health of the Creek. One way to do this is to capture the water with a raintank and then return the water back to your house or into your garden. Another way to do this is to build a raingarden, which is a garden that is purpose built to filter and slow the rate of water from impervious surfaces.

For more information visit:

[www.raingardens.melbournewater.com.au](http://www.raingardens.melbournewater.com.au)  
[www.dcmc.org.au](http://www.dcmc.org.au)