



SCIENCE + ENGAGEMENT
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Impacts of Urban Stormwater Systems on Natural Water Systems

Stormwater is rainwater that runs off hard surfaces in cities & towns, such as roads, rooftops, & driveways.

Unlike natural landscapes, these impervious surfaces prevent water from soaking into the ground.

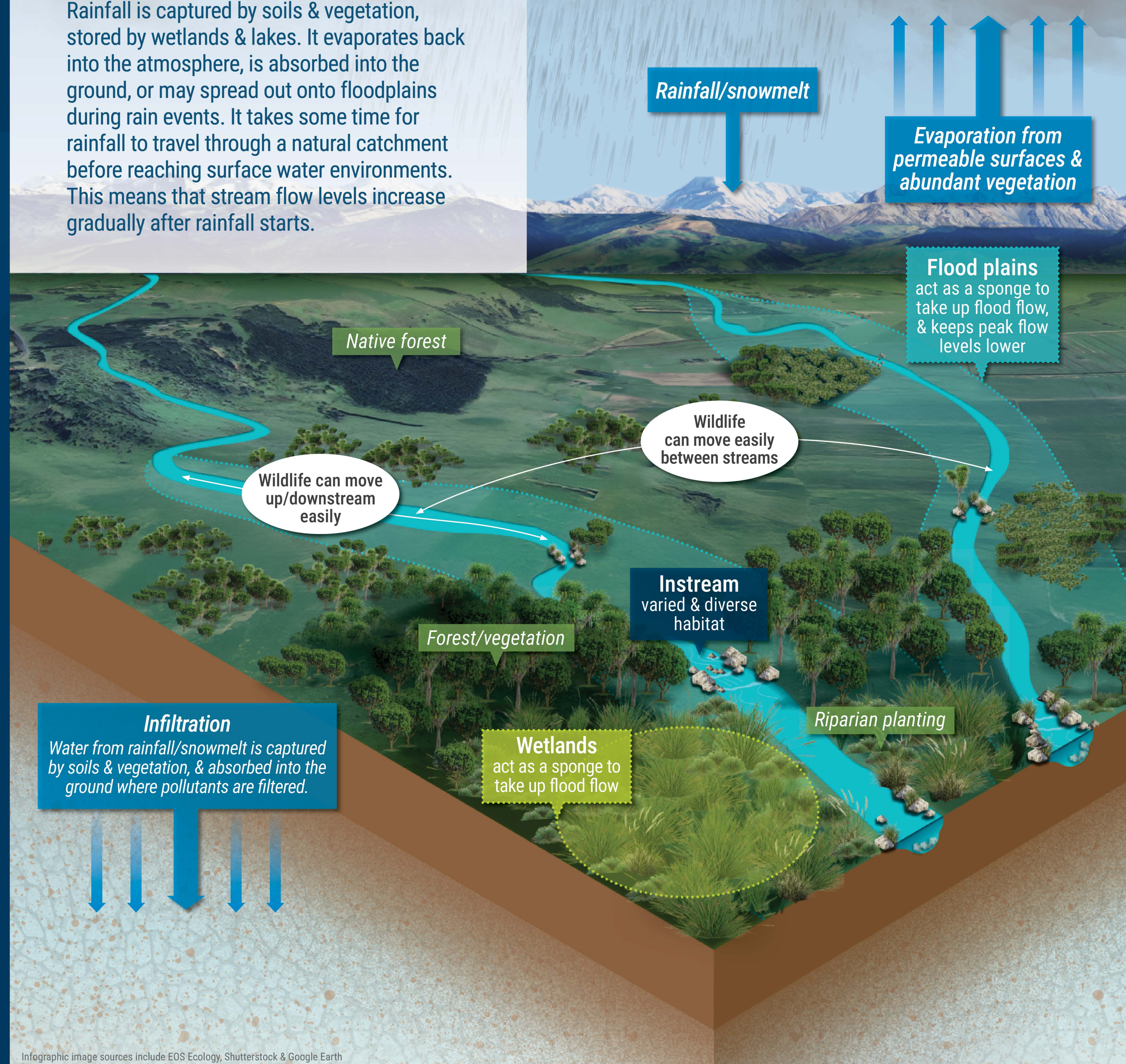
Stormwater networks consist of hard infrastructure such as lined drains, pipes, pipe outfalls, culverts. These systems efficiently direct stormwater to nearby 'receiving environments' like waterways, lakes, or coastal areas.

This infographic summarises both natural & urban water systems.



Natural Water System

Rainfall is captured by soils & vegetation, stored by wetlands & lakes. It evaporates back into the atmosphere, is absorbed into the ground, or may spread out onto floodplains during rain events. It takes some time for rainfall to travel through a natural catchment before reaching surface water environments. This means that stream flow levels increase gradually after rainfall starts.

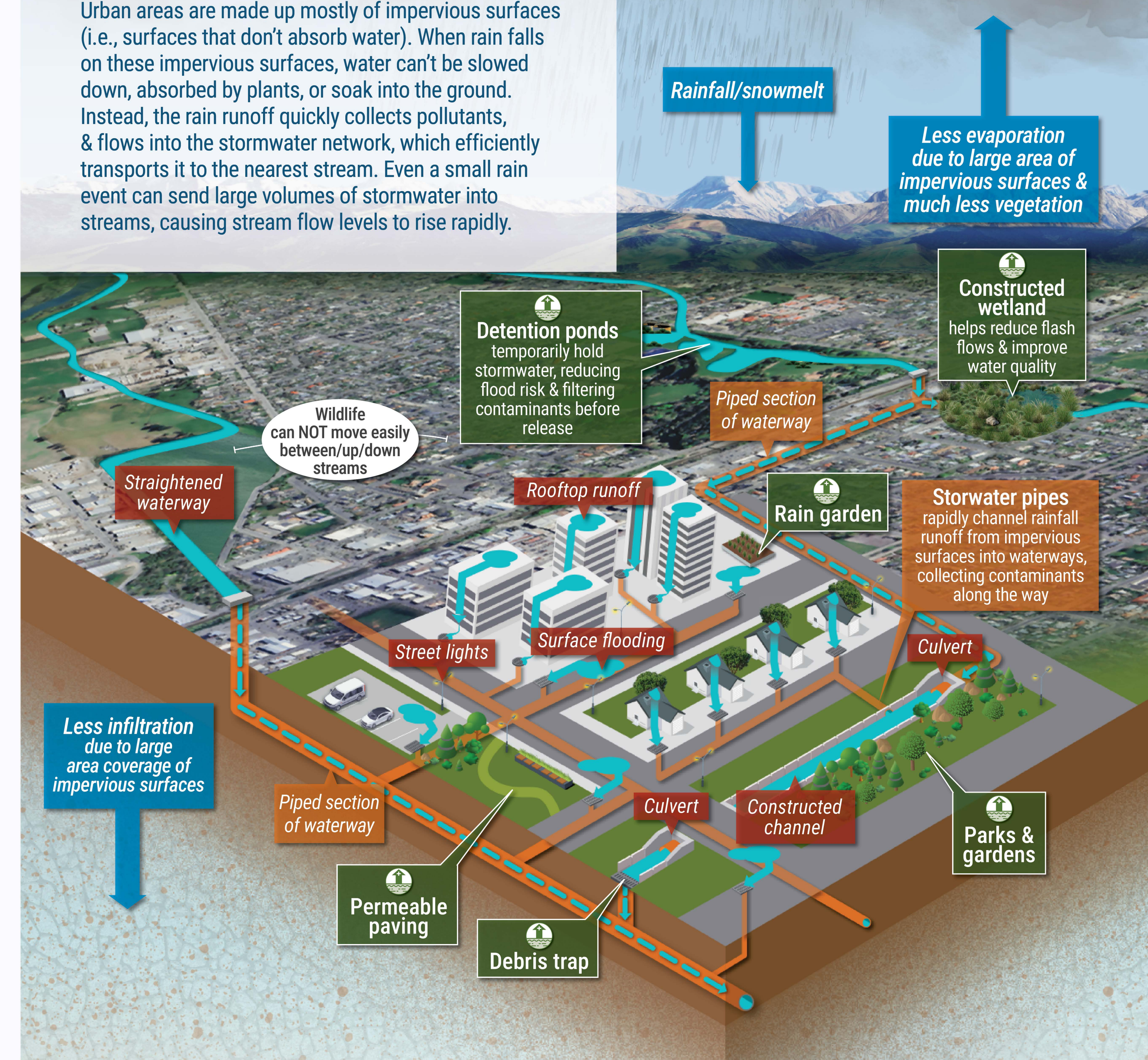


Infographic image sources include EOS Ecology, Shutterstock & Google Earth



Urban Water System

Urban areas are made up mostly of impervious surfaces (i.e., surfaces that don't absorb water). When rain falls on these impervious surfaces, water can't be slowed down, absorbed by plants, or soak into the ground. Instead, the rain runoff quickly collects pollutants, & flows into the stormwater network, which efficiently transports it to the nearest stream. Even a small rain event can send large volumes of stormwater into streams, causing stream flow levels to rise rapidly.



Symptoms of Urban Stream Syndrome – changes caused by stormwater networks in urban catchments

ALTERED FLOW REGIMES



More impervious surfaces, & an efficient piped delivery of stormwater lead to altered flow regimes, resulting in lower low flows & more extreme & frequent flood flows (i.e., flashy flows). Low flows are exacerbated by widened waterways designed to accommodate flood flows, but providing even less water depth during base flows.

POLLUTANTS



During rain events pulses of contaminated water enter streams. This stormwater can contain pollutants such as heavy metals, fine sediment, & polyaromatic hydrocarbons. Water temperatures increase as a result of impervious surfaces heating up rainwater runoff, less riparian shade, & less water in the stream during base flow levels.

DISCONNECTED RIPARIAN ZONE & FLOOD PLAIN



The more stormwater pipes connecting the wider catchment to a waterway, the less influence the riparian zone has on a stream. This is partly because the process of riparian vegetation trapping overland & flow is circumvented by stormwater pipes directing stormwater straight to the stream. Waterways are also constrained within deeper & wider channels, with less connection to a riparian flood- or fresh-plain, where water would naturally spread onto during elevated flow.

SIMPLIFIED HABITATS



With greater storm flows to deal with, streams are widened & straightened, meaning they have simplified or homogeneous habitats. This means they're unable to support diverse communities of living organisms, & provide fewer areas of refuge during storm flows.

FRAGMENTED HABITATS



Instream structures (e.g., culverts, pipes) act as potential barriers to the movement of fish & invertebrates. Streetlights & hard surfaces (e.g., roads, roofs) can confuse invertebrates & disrupt their life cycle.

FUNDED BY:



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