

Can Plants Help Our Cities Adapt To Climate Change?

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Urban Plants

- In the UK a large range of urban plants (in parks, gardens and ex-industrial sites) are not native.
- This genebank gives some resilience against climate change.
- Many of these plants would not survive without help from humans (weeding, irrigating and adding fertilizer).
- Some can spread by seed (or off-shoots) and are successful colonisers, such as *Buddleia* (butterfly bush).
- Many non-native plants support pollinating insects through pollen and nectar, but many insects still rely on native plants to feed their larvae.
- Many native plants also live in our cities, especially in local nature reserves and parks.

Numerous urban plants are non-natives



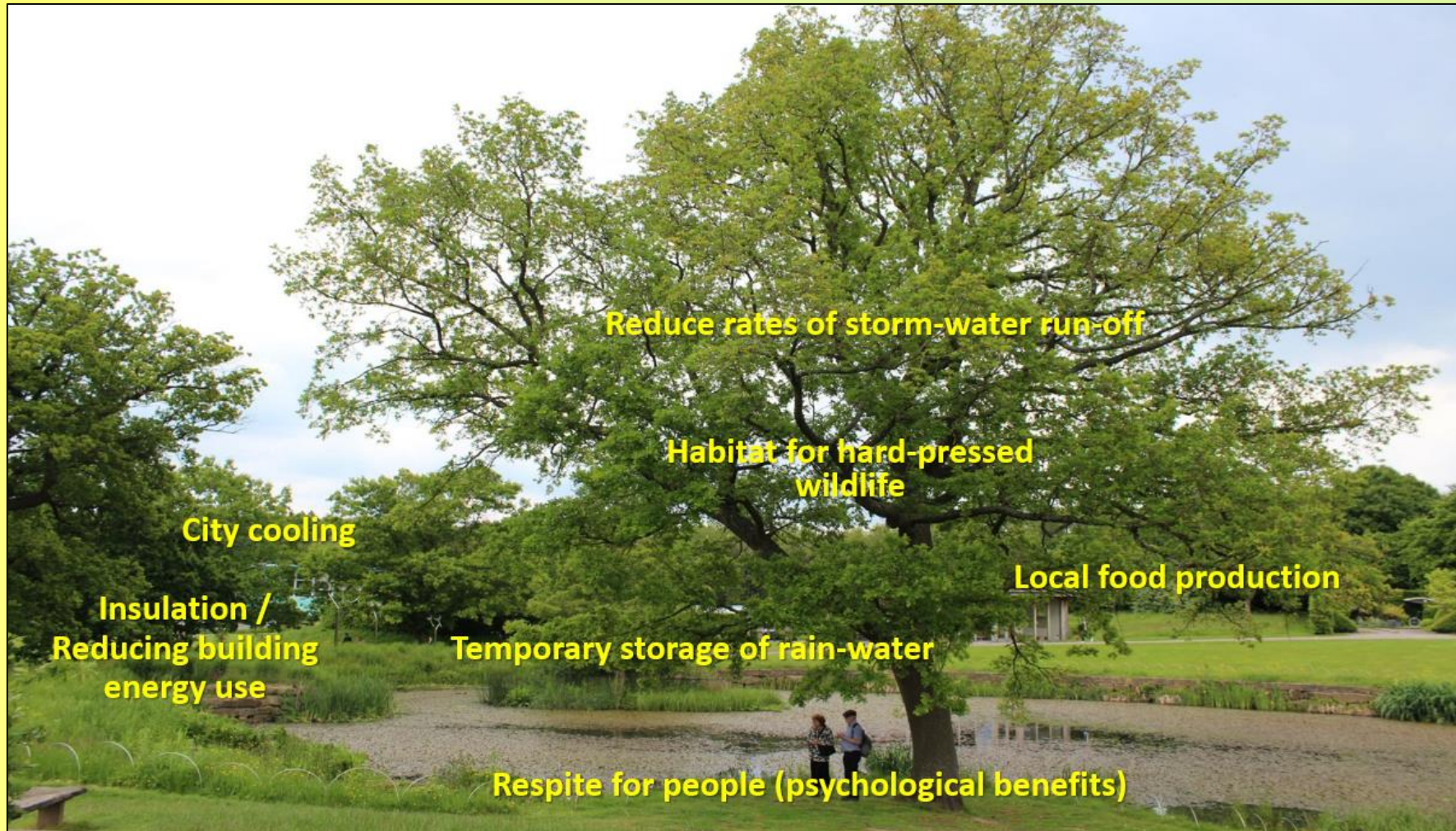
***Some non-native plants
can provide resources for
native wildlife***



Key urban problems associated with a changing climate

- Higher temperatures – heat waves, reduced human thermal comfort, enhanced urban heat islands.
- More extreme rainfall – flooding.
- Drought and inconsistent water supplies.
- More reliance on energy to cool buildings in summer.
- Loss of biodiversity.
- Inconsistent food supplies.

How can plants mitigate the effects of climate change?



City Cooling

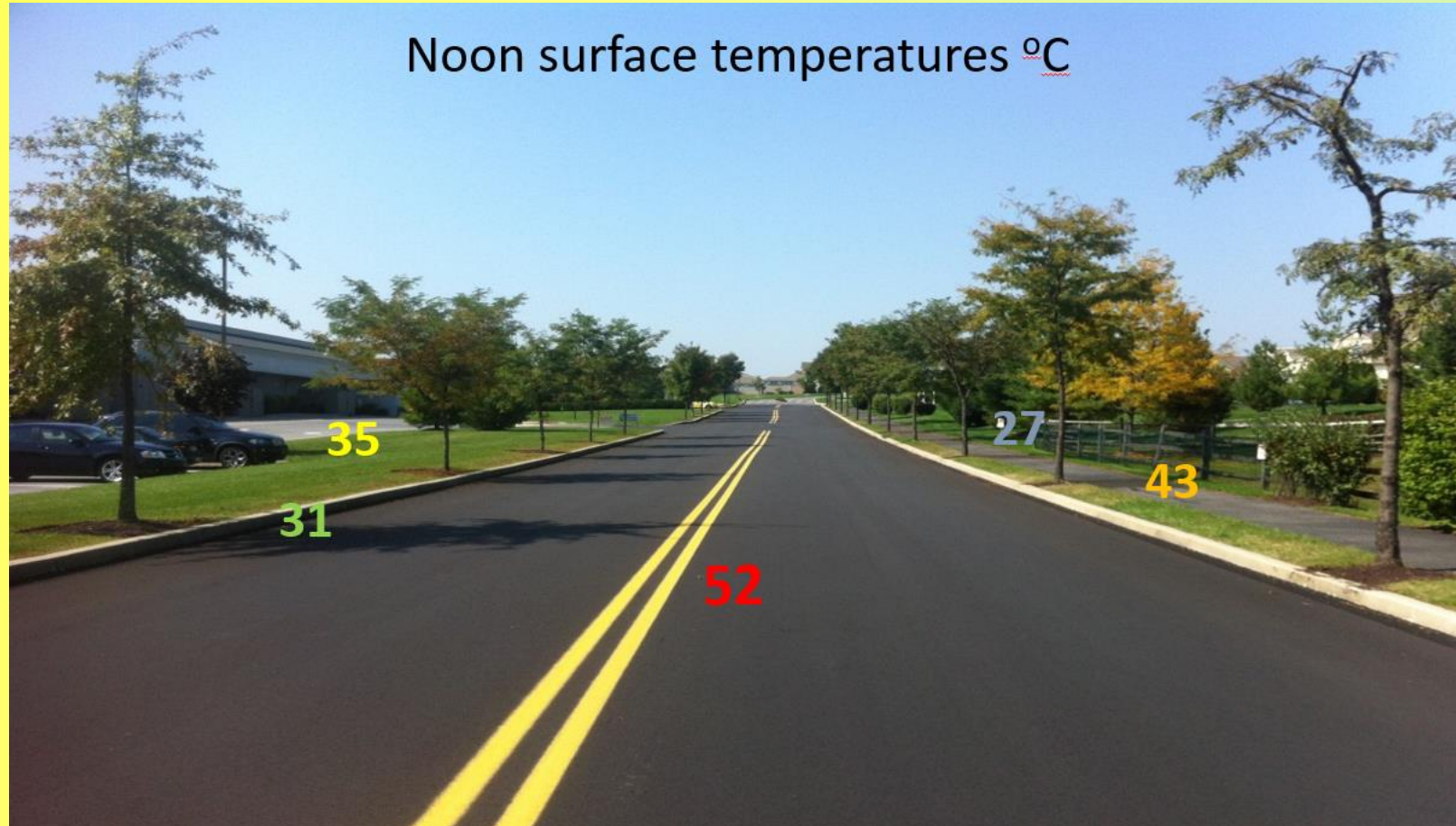


Plants can reduce the effects of the urban heat island.

Dark surfaces (which absorb and store heat) and emissions of heat from anthropogenic activities (e.g. industry, traffic and air conditioning) results in higher temperatures in towns and cities compared with rural areas. This creates a 'heat island'.

Plants can help to reduce temperatures in urban areas.

Cooling cities – street trees



Trees planted alongside roads can significantly reduce temperatures.

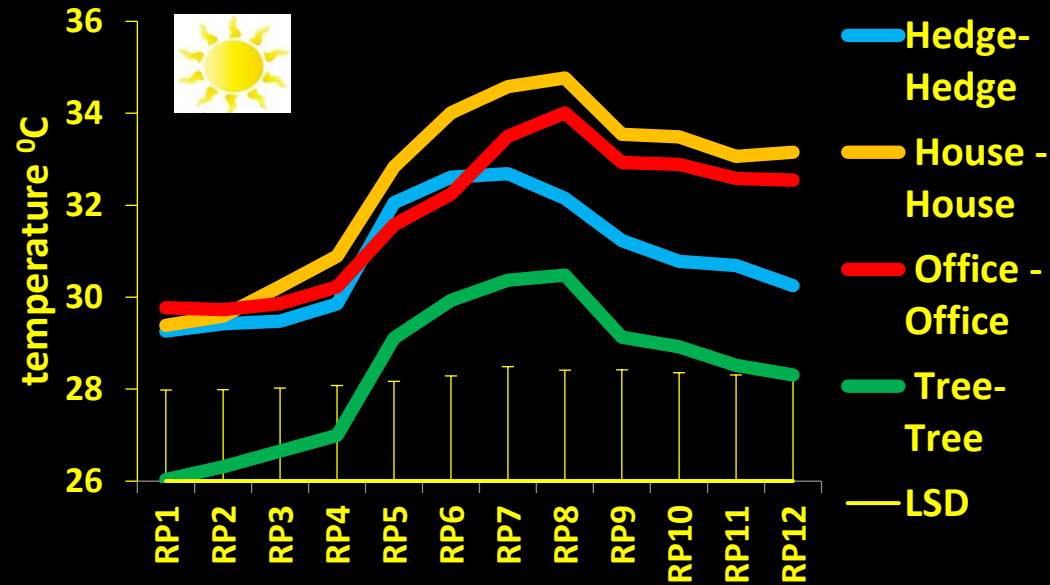
The following slide shows the results of a research project published in 2016.

Road temperature profiles –

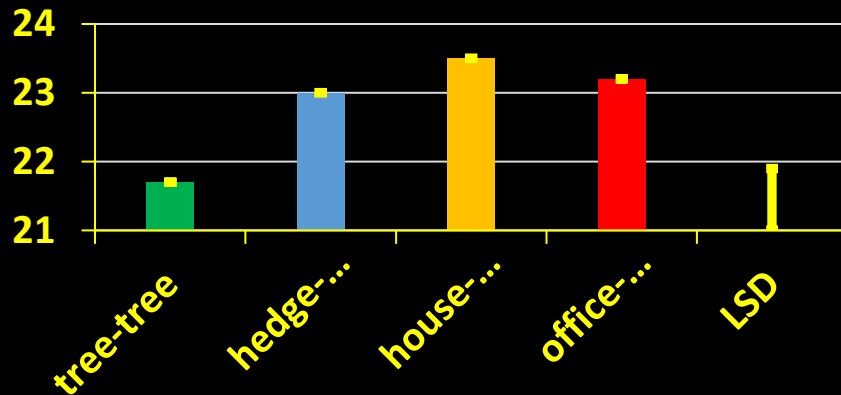


Presence of street trees keeps roads cool

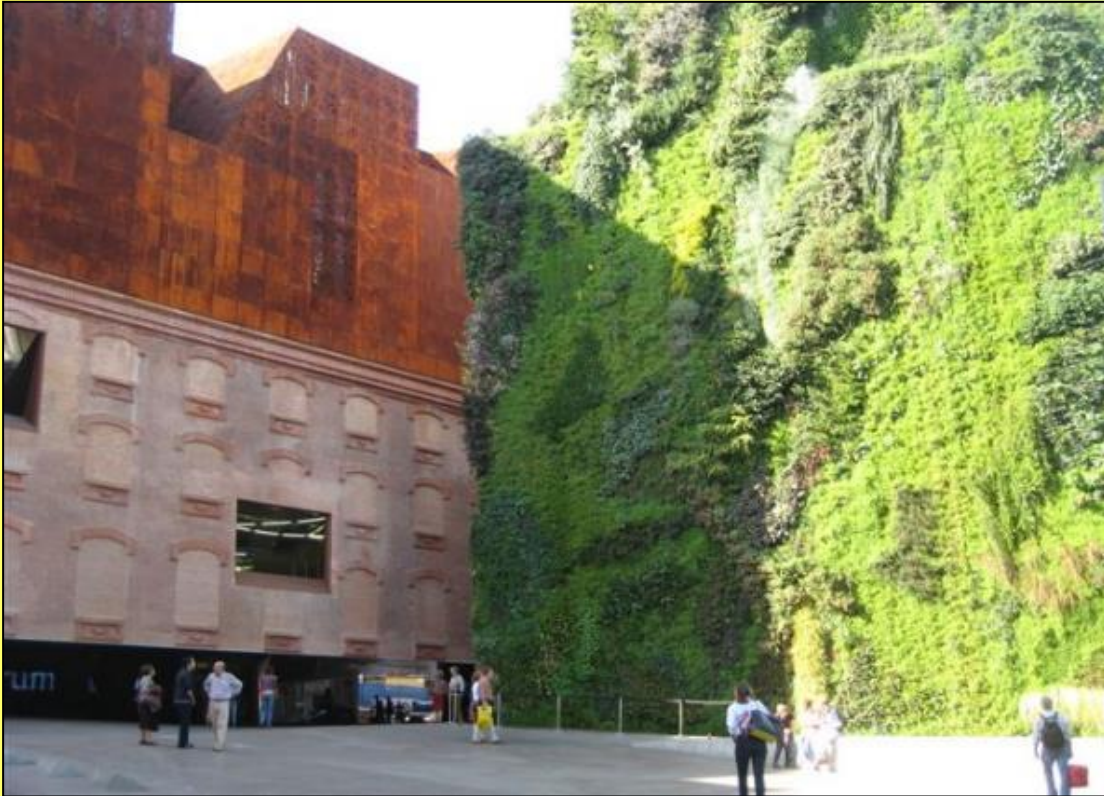
(Taylor et al., 2016)



Air Temp.



Cooling cities – cooling buildings



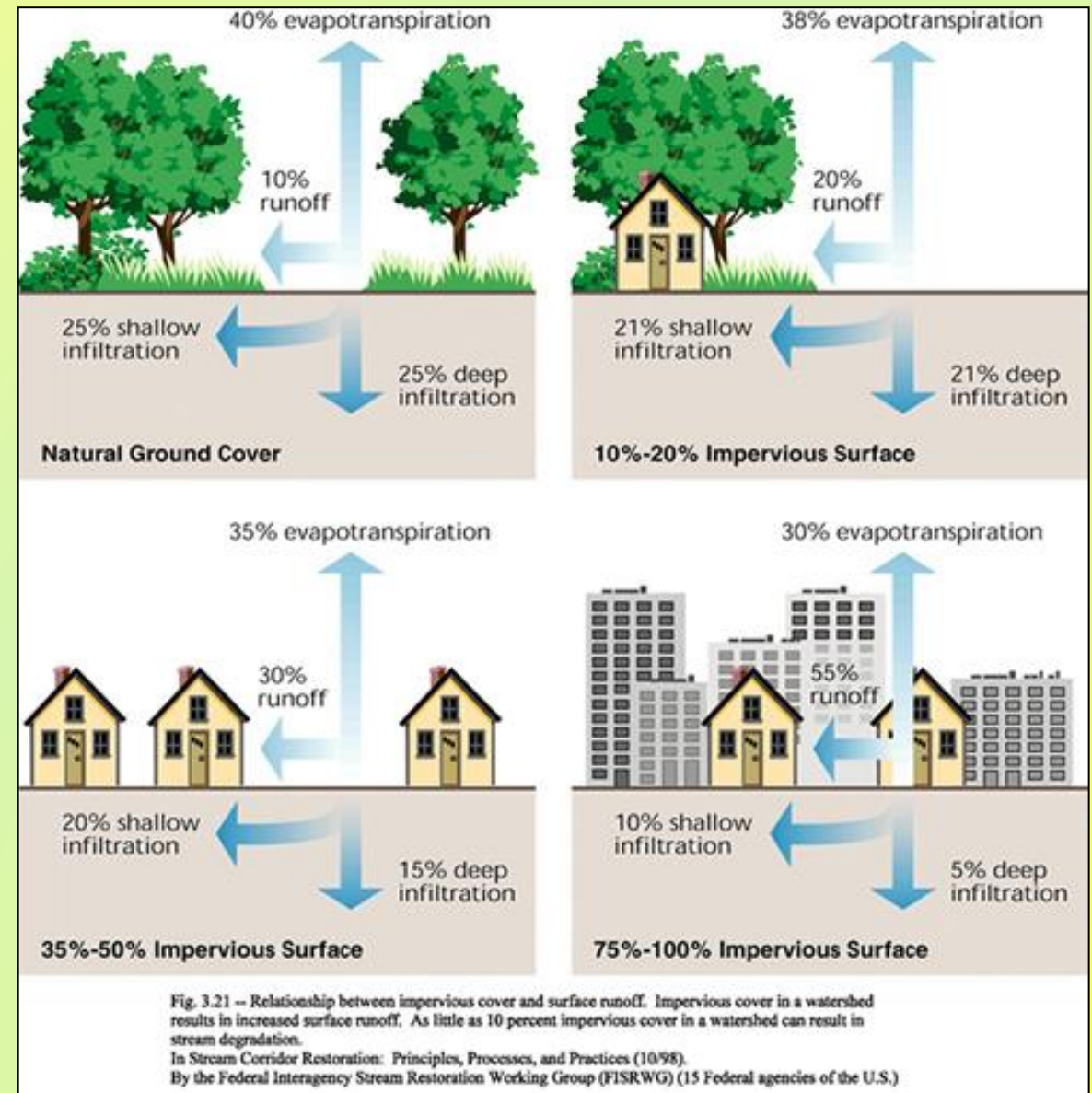
- Green roofs and roof gardens help insulate buildings against extremes of temperature.
- Research suggests that some plant species such as *Viburnum* & *Cistus* can result in 3-4°C surface cooling.
- Green walls, comprising climbing plants and shrubs can result in cooling of up to 9°C (*Cameron et al., 2014*)

Reducing flood risk

Urbanisation increases the risk of surface water flooding due to the reduction in infiltration (due to impermeable surfaces), reduced evapotranspiration (less natural ground cover) and rapid water transfer (roofs, gutters, etc).

Increasing green spaces in urban areas helps to reduce runoff and the risk of flooding.

Fine textured plants (lots of small leaves) hold more water
(Ismail PhD data)



Urban designs to store water



Urban designs to store water

Berms can interrupt and help to store water.



Raingardens can store water and can be biologically rich.



Landscapes as carbon sinks

- Trees and other plants do sequester carbon – but
 - Not really at rates fast enough to keep up with current emissions
 - Wood (lignin) is not coal – it will rot and release CO₂ eventually
 - The soil is the real carbon storage destination – but depends on its capacity to store more carbon.
- We need to move all our construction, plant production and maintenance techniques to green energy, otherwise the carbon-footprint of landscapes outweighs benefits! Even disturbing soil releases CO₂ and NO_x.



Conclusions

- Urban plants provide benefits to the urban environment.
- These benefits can help mitigate some of the local effects of climate change, such as increased heating and higher (more intense) rainfall.
- Climate change will change the palette of plants that can be used.
- We need to anticipate which plants will survive and which will not.
- Landscape design will need to reflect new needs - cooler environments and improved water management.



References

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