

Opportunities, Limitations, and Considerations of Trees as a Nature-Based Solution for Urban Heat

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Climate Toolkit Symposium, Pittsburgh, PA
October 27, 2025



Collaborators



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Trent Ford



M. Ross Alexander



Lindsay Darling



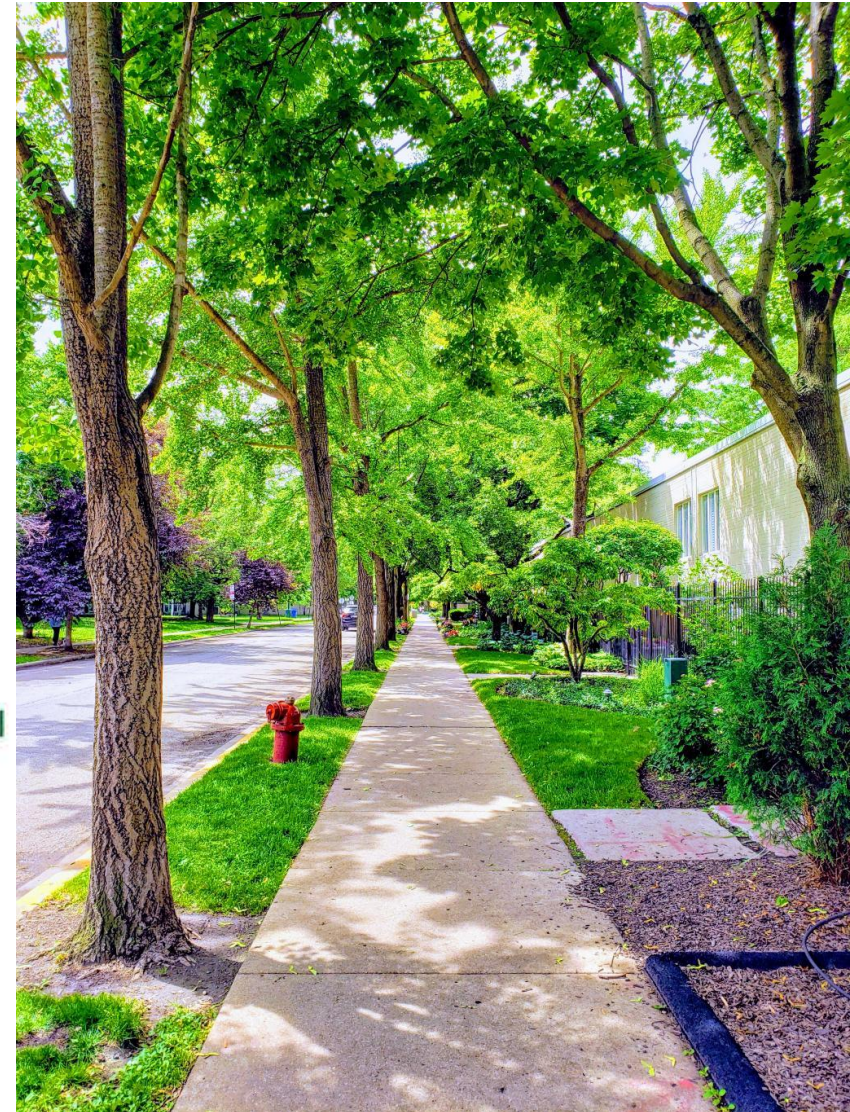
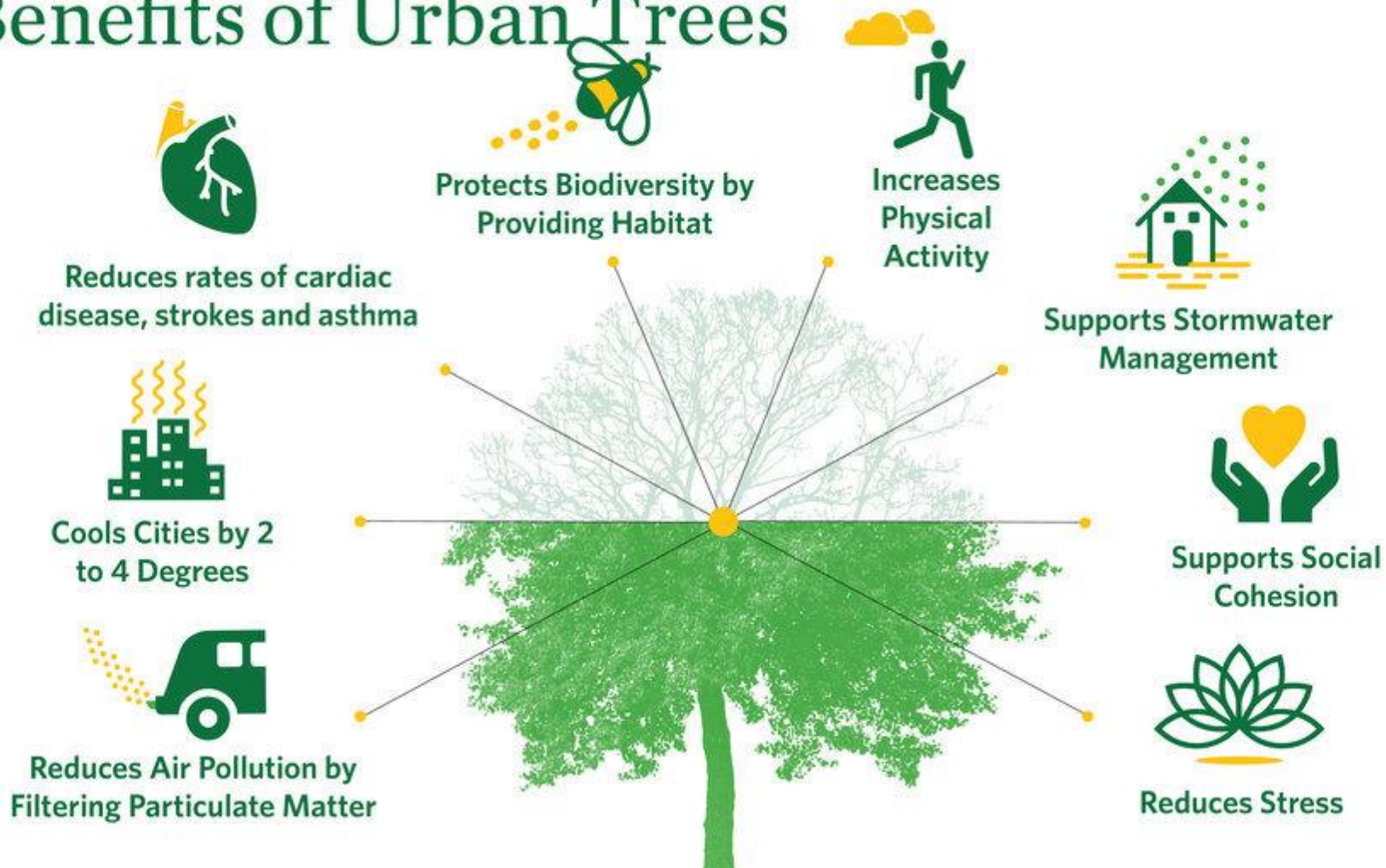
Renata Poulton
Kamakura



Ayo Deas

Trees provide many benefits.

Benefits of Urban Trees



**Cooling
benefits are
well-studied
and clear.**

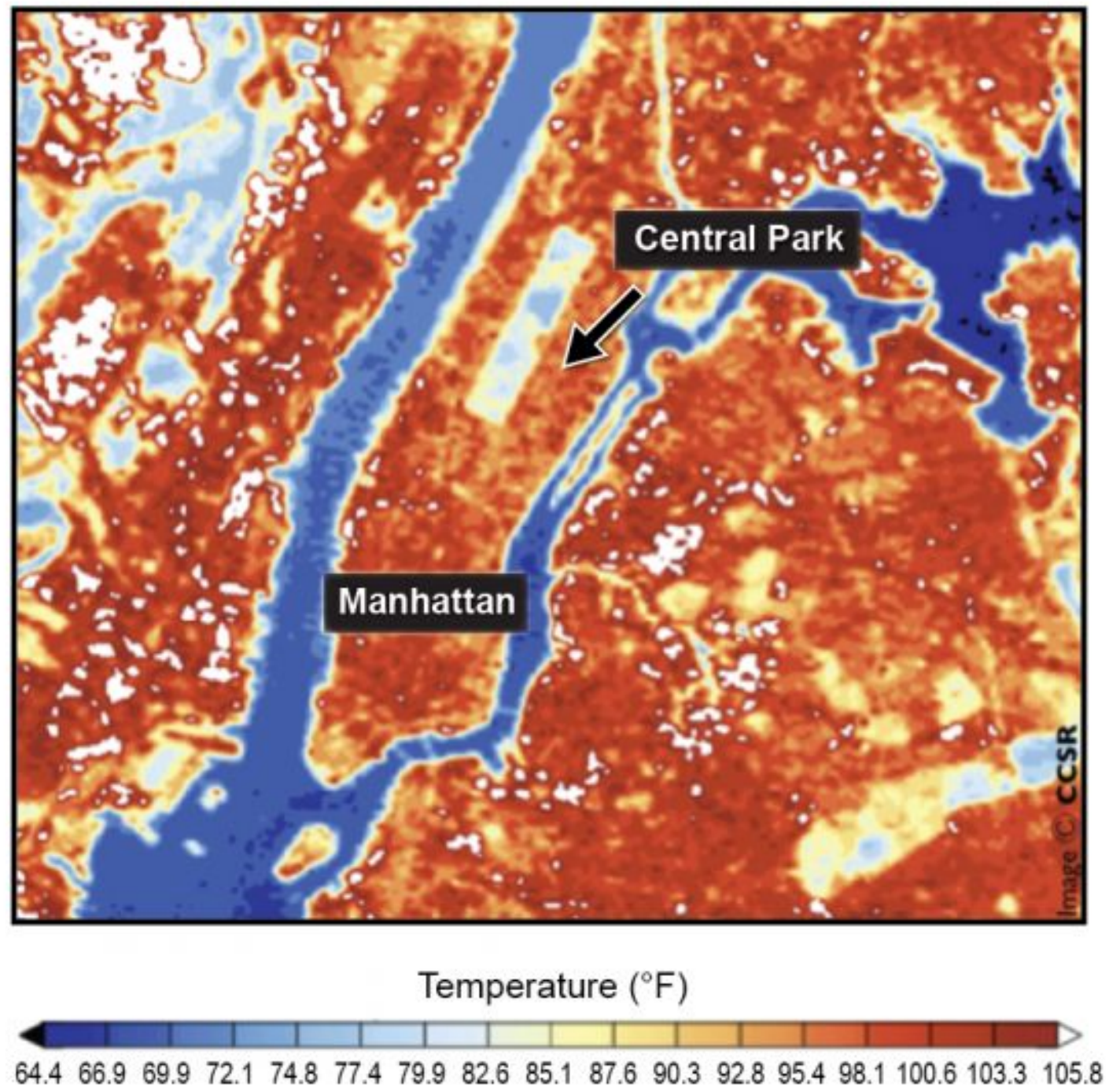


Figure: Center for Climate Systems Research,
Columbia University (via globalchange.gov)

A large, mature tree with a thick trunk and a wide, spreading canopy of green leaves stands in the foreground of a grassy field. The tree is positioned on the left side of the frame. In the background, a line of other trees is visible against a clear blue sky. The sun is visible in the upper left corner, creating a bright glow. The overall scene is a peaceful, natural landscape.

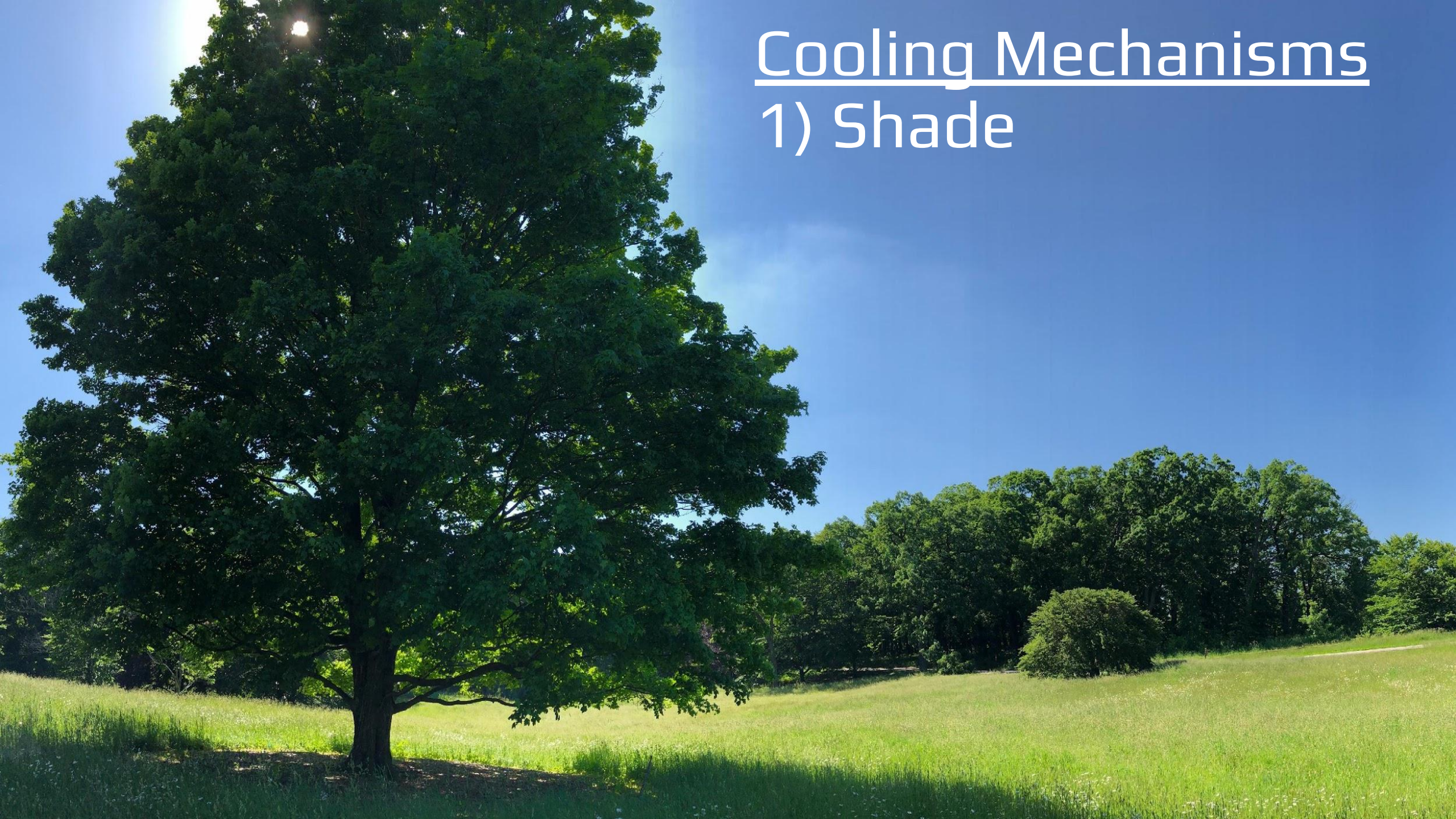
Trees cool more
than other
vegetation types
because they're BIG.

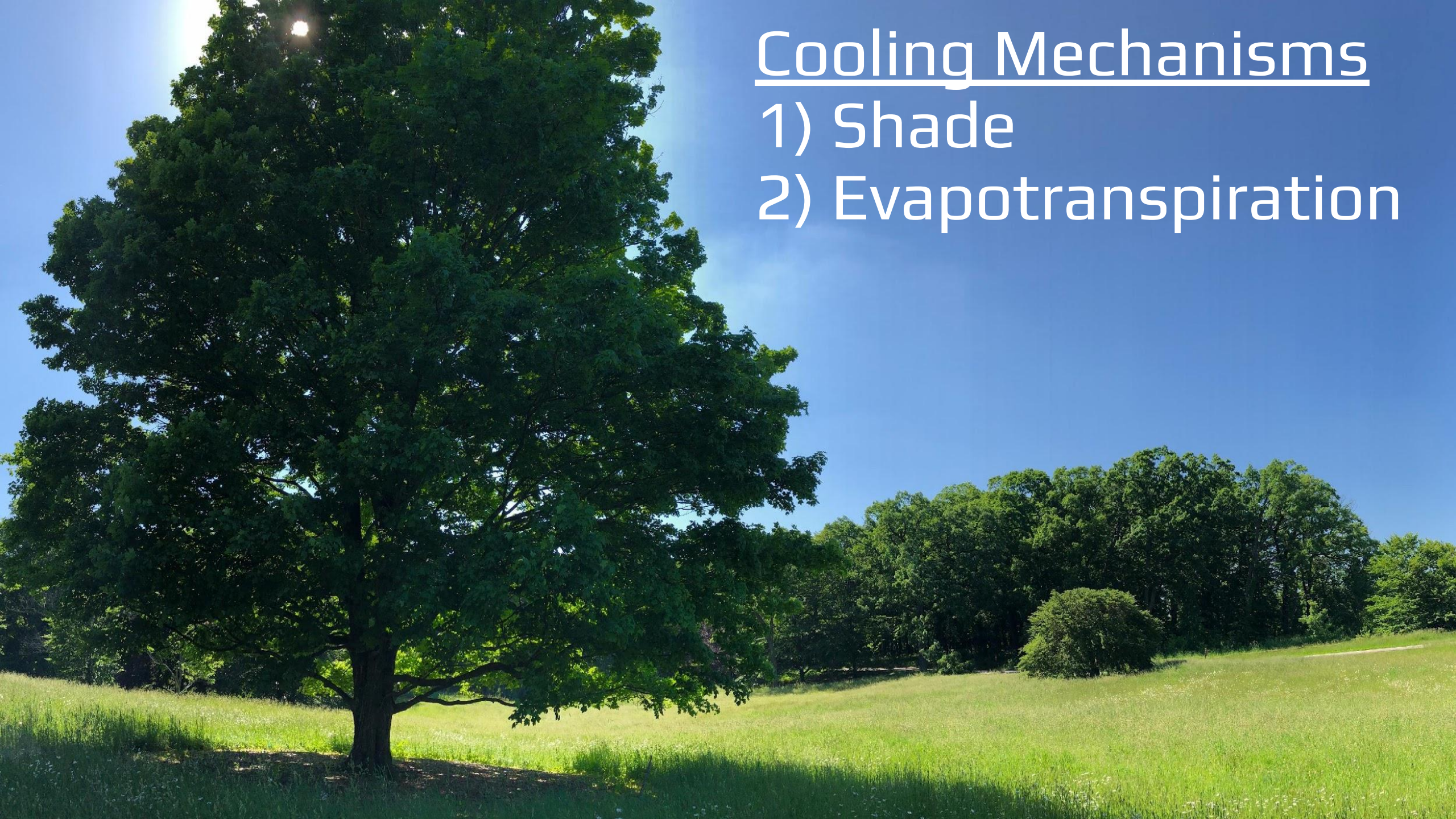
Cooling Mechanisms



Cooling Mechanisms

1) Shade



A large, mature tree with a dense canopy of green leaves stands in the foreground on the left. It casts a shadow on the grass below. The background features a line of similar trees on a slight rise under a clear blue sky. The sun is visible as a bright spot in the upper left corner.

Cooling Mechanisms

1) Shade

2) Evapotranspiration

Cooling effects vary by species, climate, and location...

Tucson,
AZ



Chicago,
IL



Cooling effects vary by species, climate, and location... but so must goals and benchmarks.

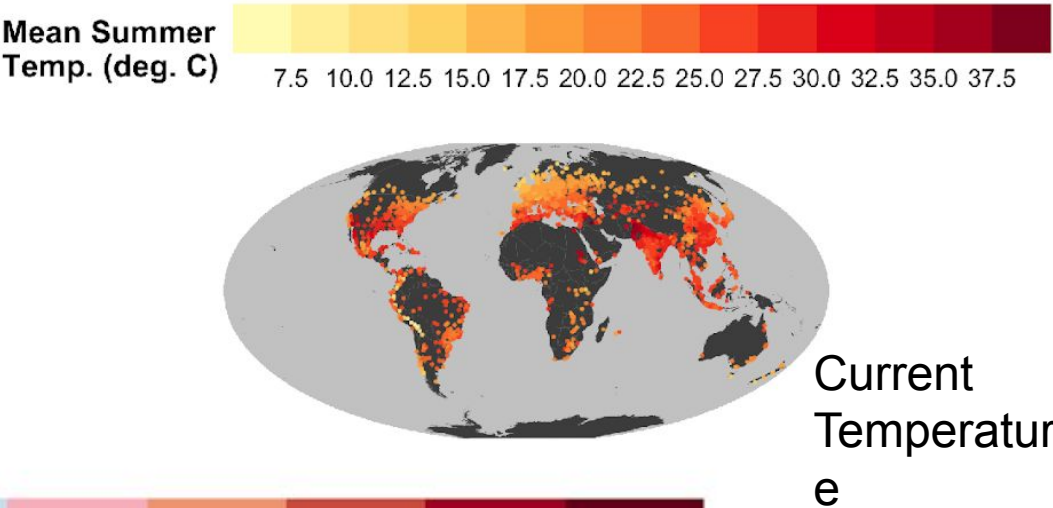
Tucson,



Chicago,

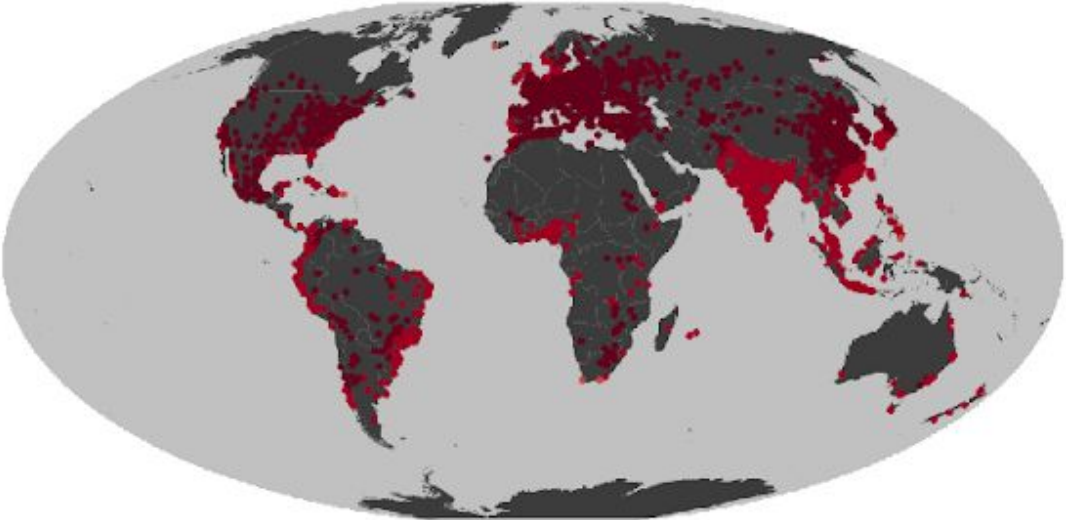
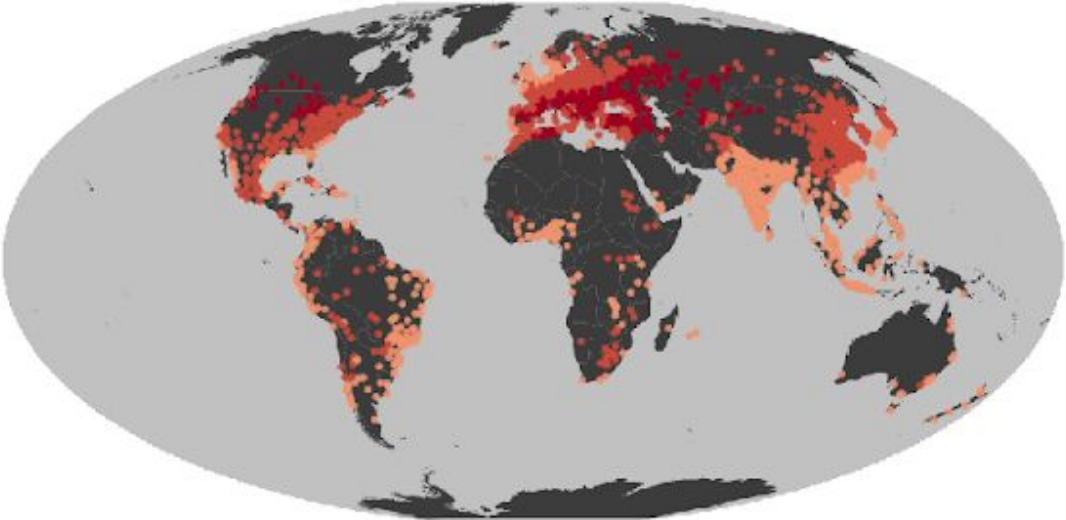


Projected change in temperature by 2100: Warming varies by region



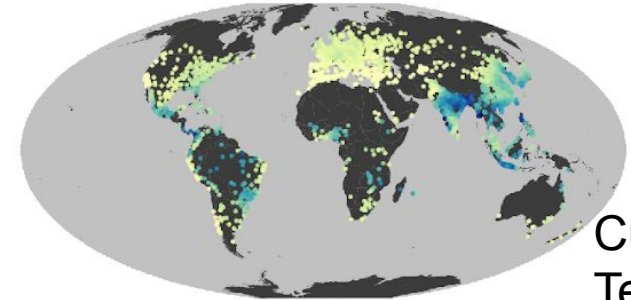
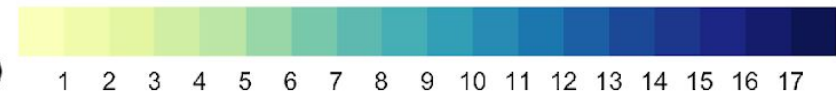
SSP2-4.5

SSP5-8.5



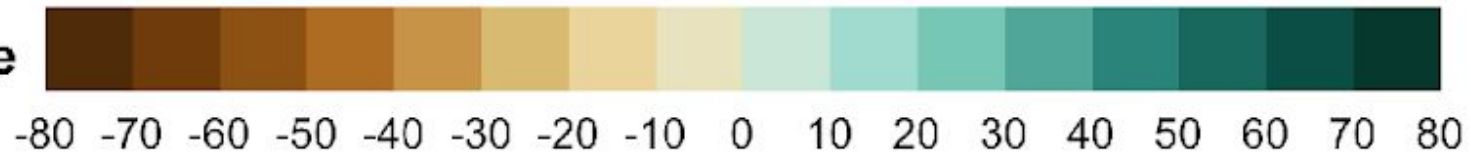
Projected change in precipitation by 2100: ***HIGHLY*** variable

Mean Summer
Precip (mm/day)

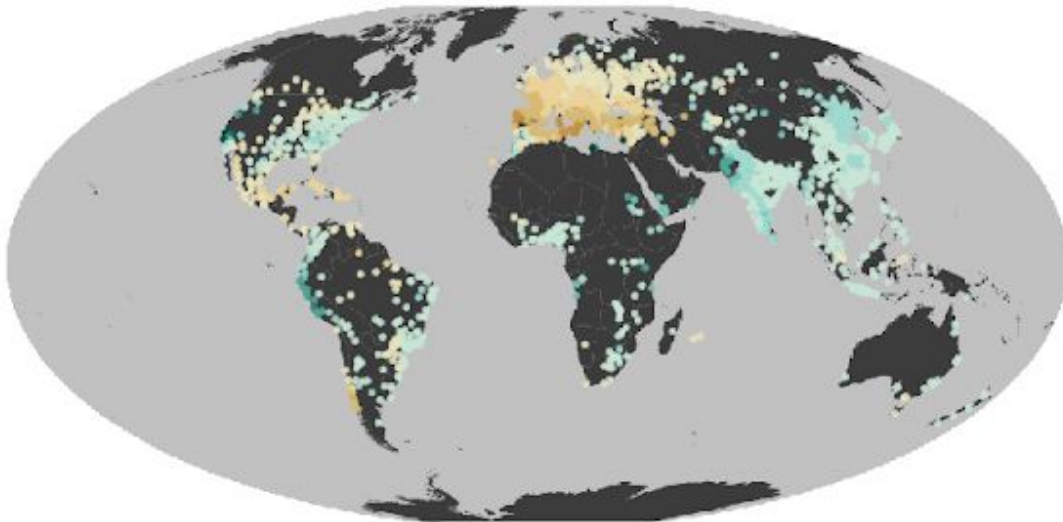


Current
Temperature

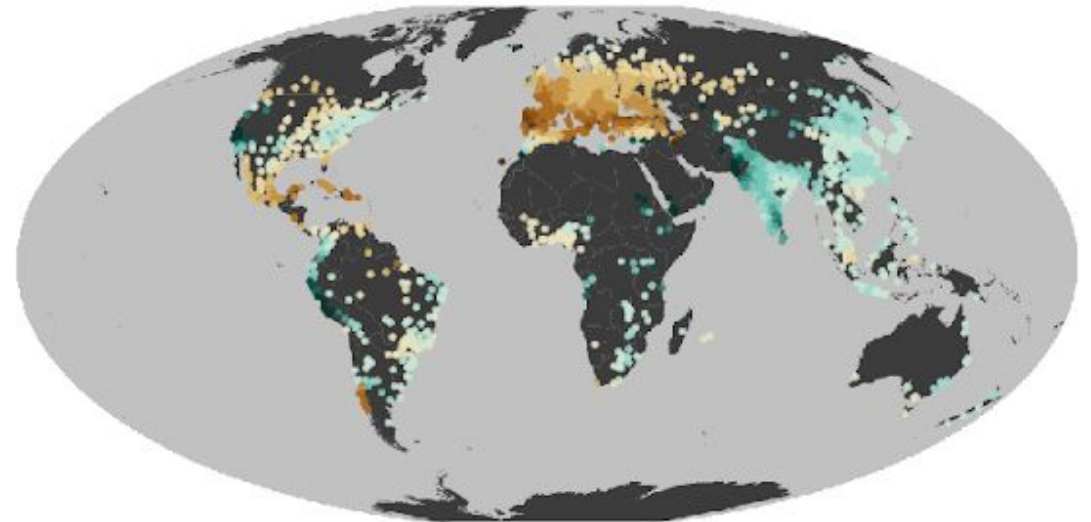
Precip Change
(%)



SSP2-4.5



SSP5-8.5

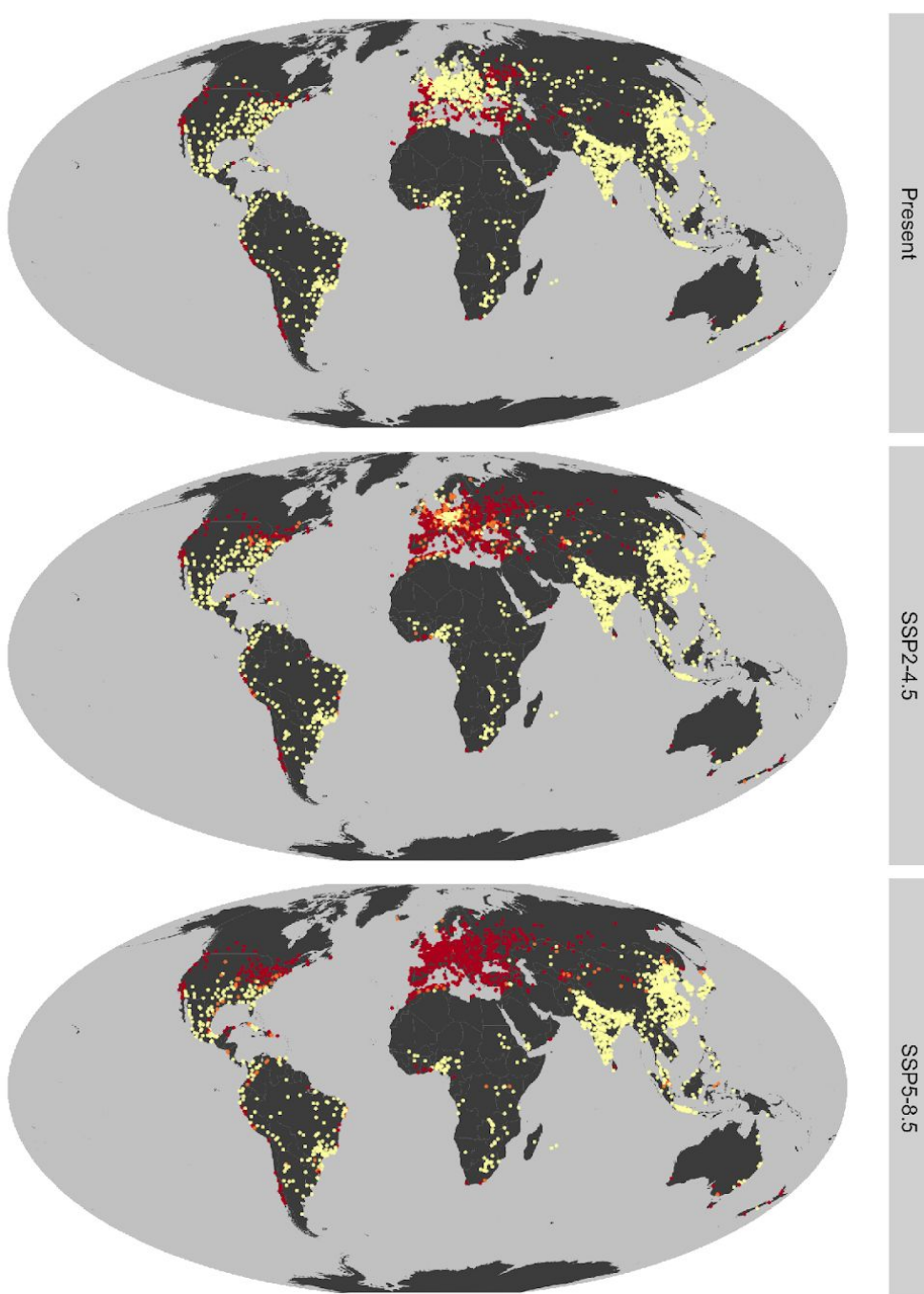


Data: NASA NEX-GDDP CMIP6

A

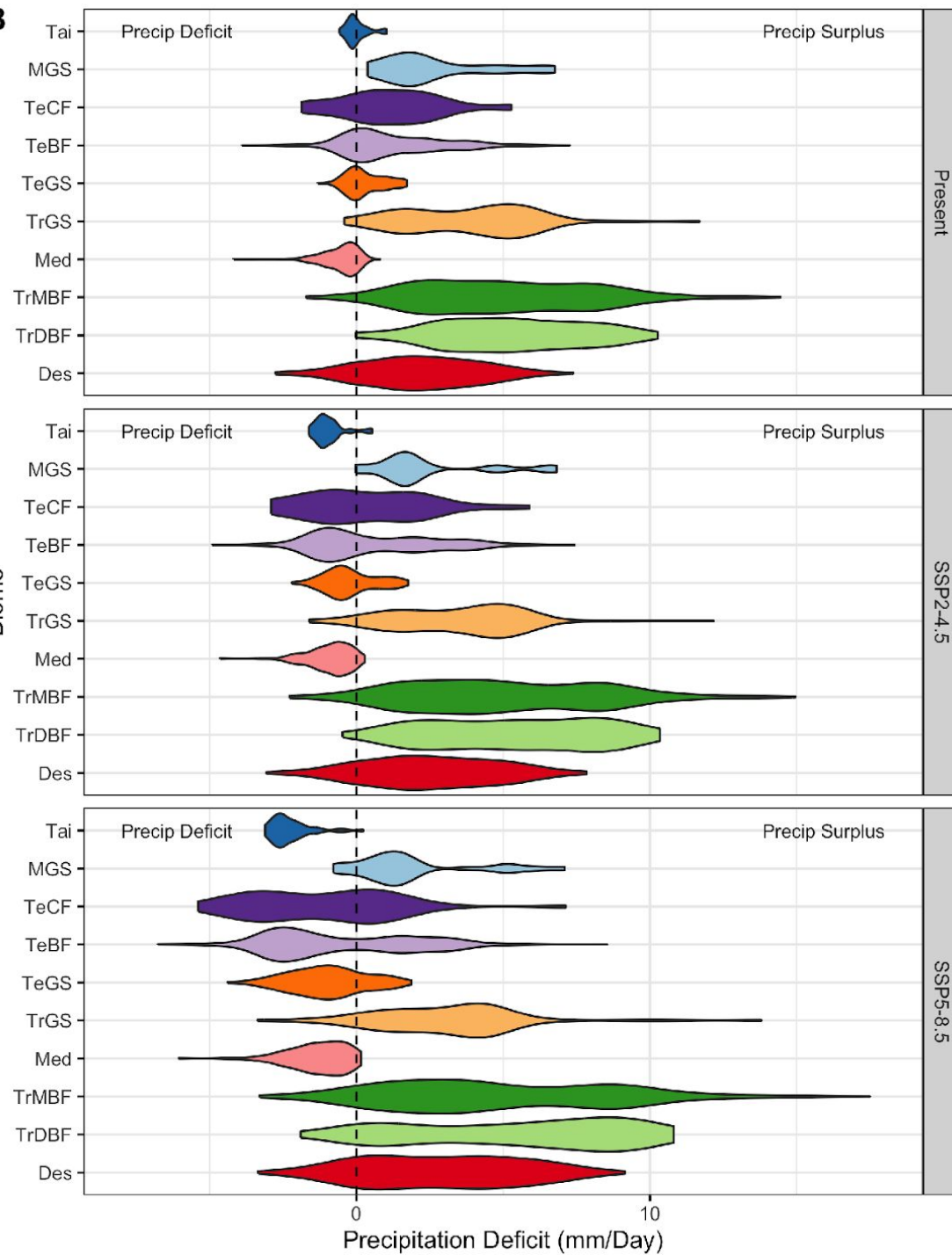
Deficit Risk

- High
- Medium
- Low



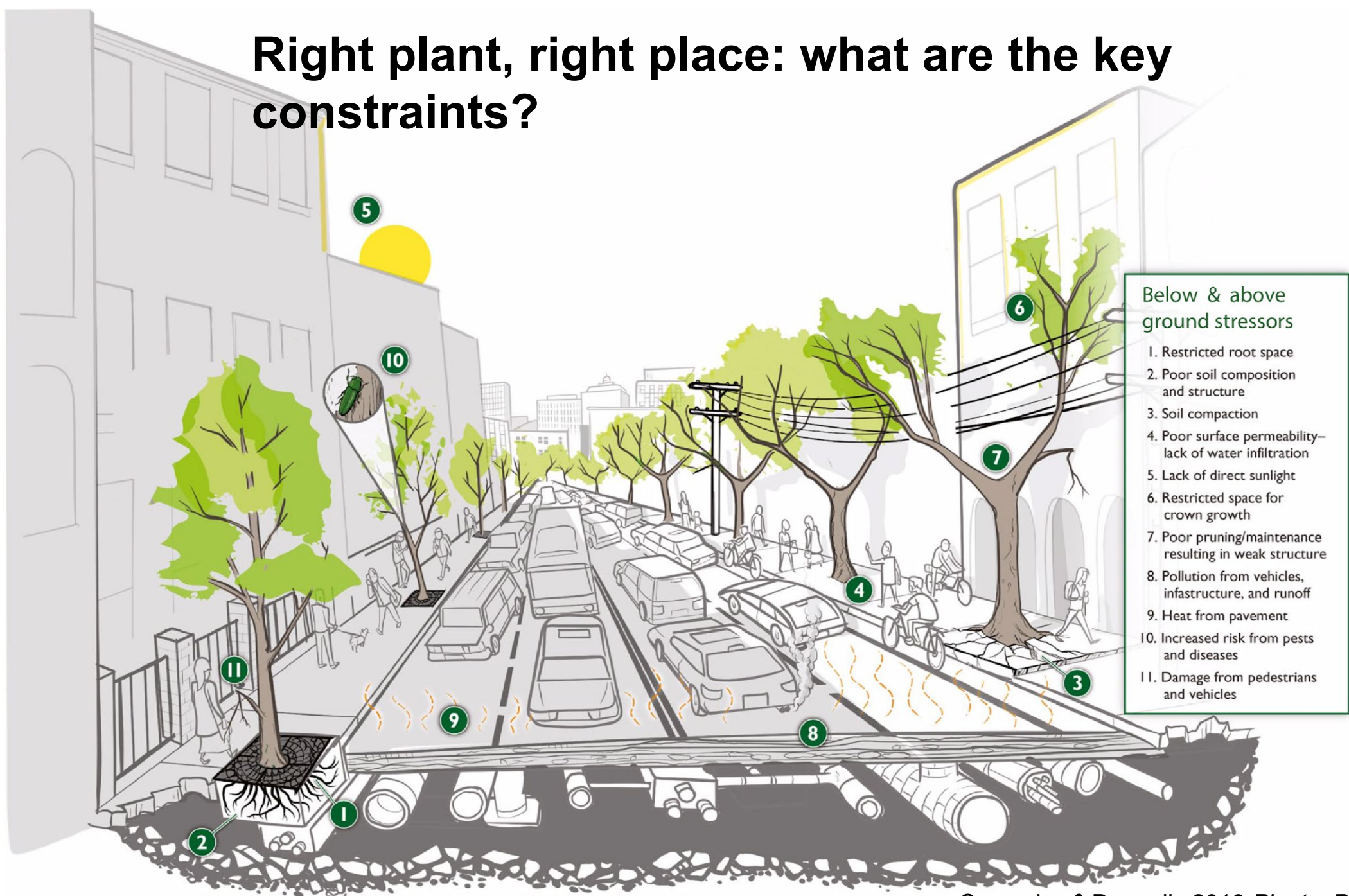
B

Biome





Right plant, right place: what are the key constraints?





Species selection is critical... but a lot of work remains to make robust recommendations

Photo: A. Salisbury



Adaptive management is ***essential*** for coping with uncertainty.



Effective solutions
require action **now** with
a plan for responding
to **tomorrow's**
unknowns.



A large, mature tree with dense green foliage stands on the left side of a grassy field. The field is covered in tall, green grass with some white wildflowers. In the background, a line of trees is visible against a clear blue sky. The sun is visible in the upper left corner, creating a lens flare effect.

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