

Water allocation tradeoffs in urban ecosystems

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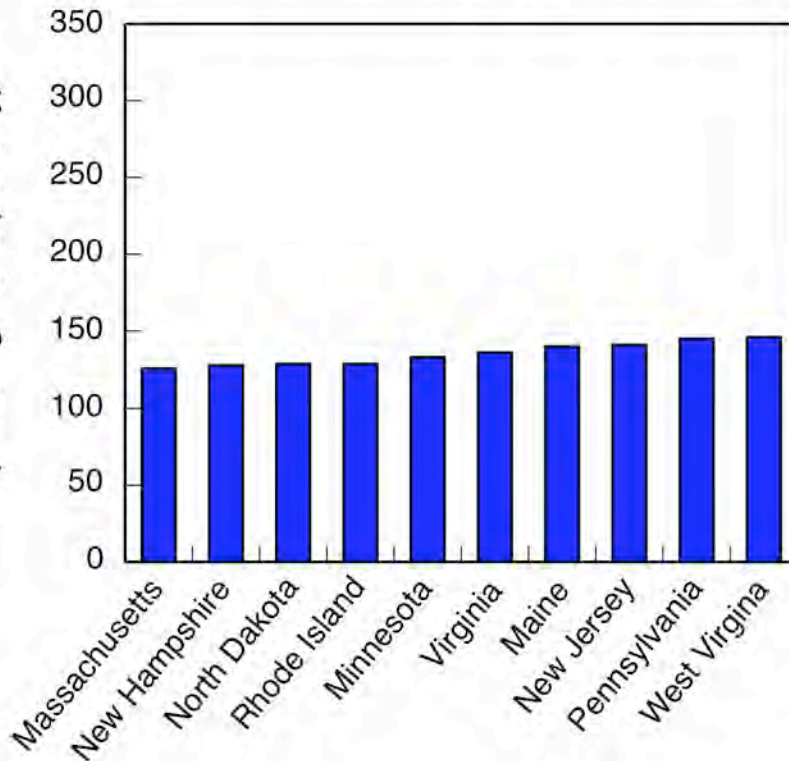
Outline

- **Western cities have a high water demand due primarily to outdoor water use**
- **To cope with reduced supply, both technological and ecological changes are required**
- **There are many tradeoffs in making western cities “greener”**
- **Optimizing these cost-benefits requires new approaches to urban landscaping**

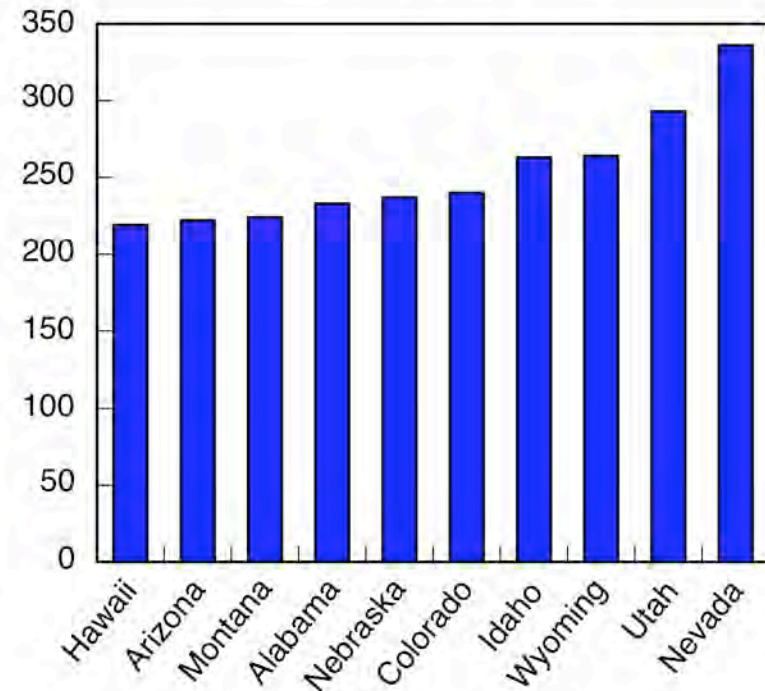


Public supply water withdrawals per capita
(million gallons per day)

Bottom 10 water use per capita, 2000



Top 10 water use per capita, 2000

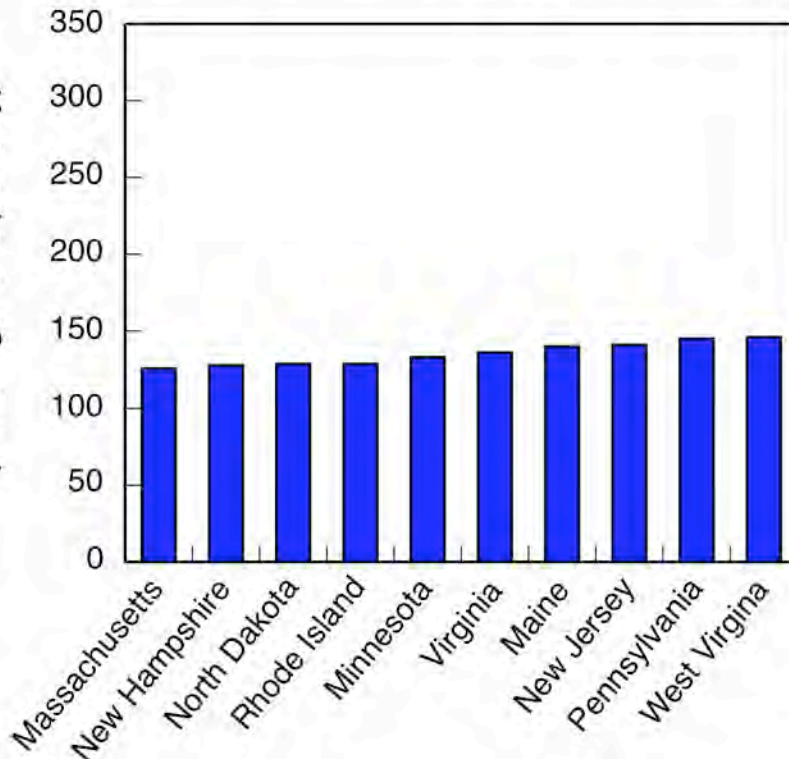


Source: USGS

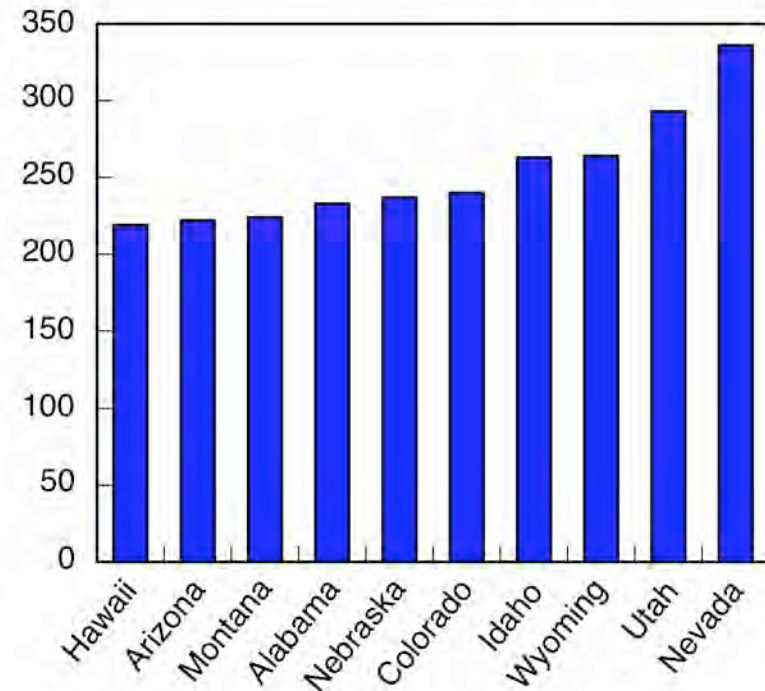


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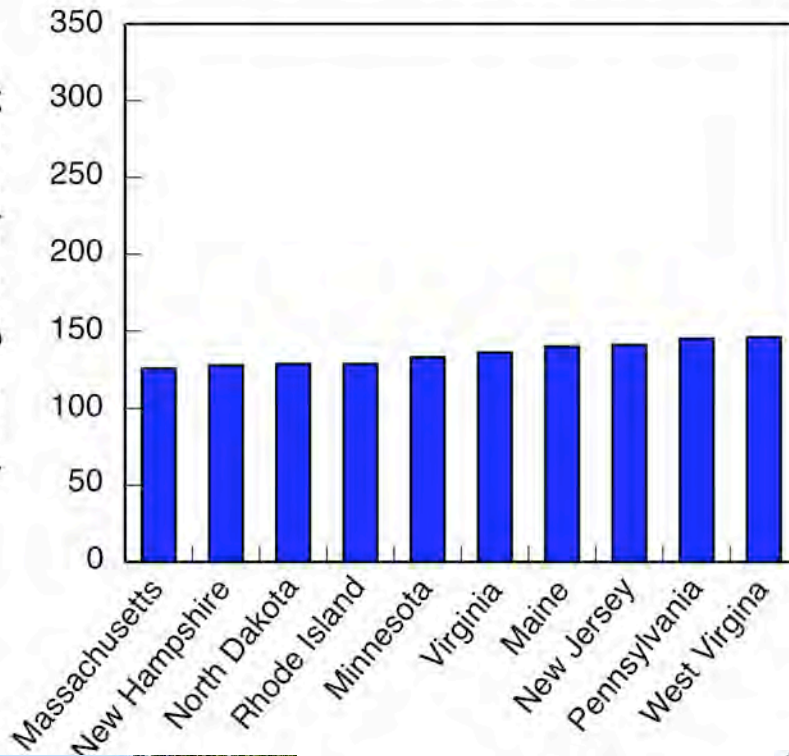


Source: USGS

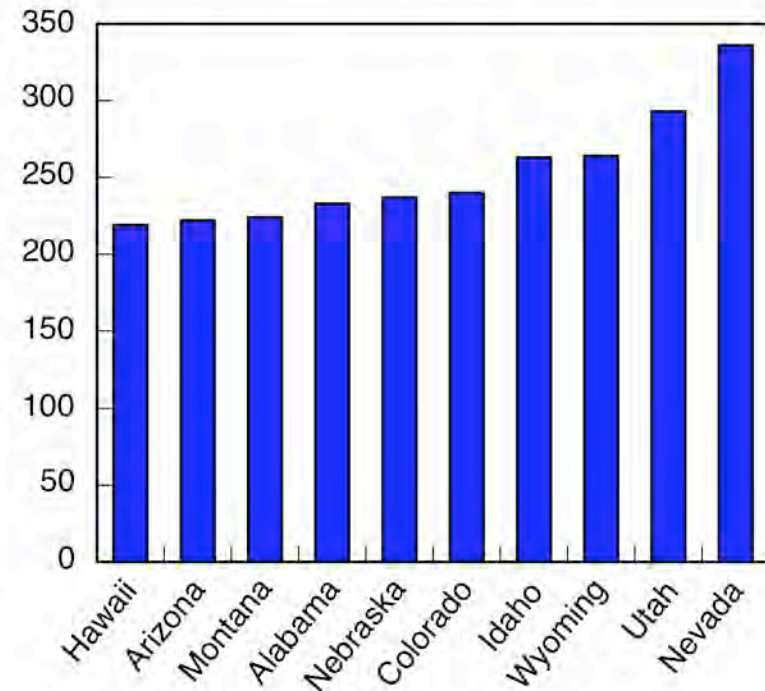


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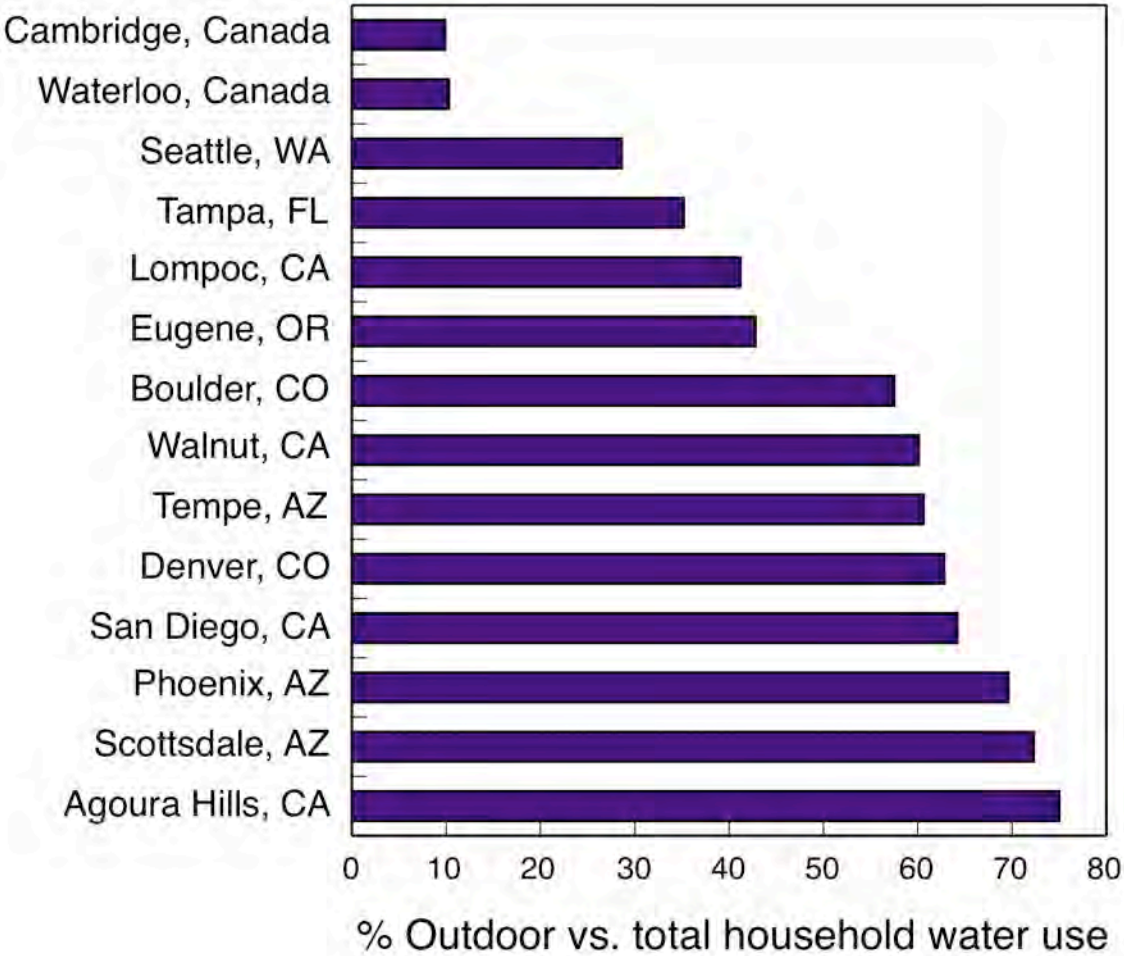
Top 10 water use per capita, 2000



Source: USGS



Outdoor irrigation dominates household water use in the West



Source: Mayer et al. 1999, American Water Works Association



New technology can make water application more efficient



But changes to the species mix will still be required



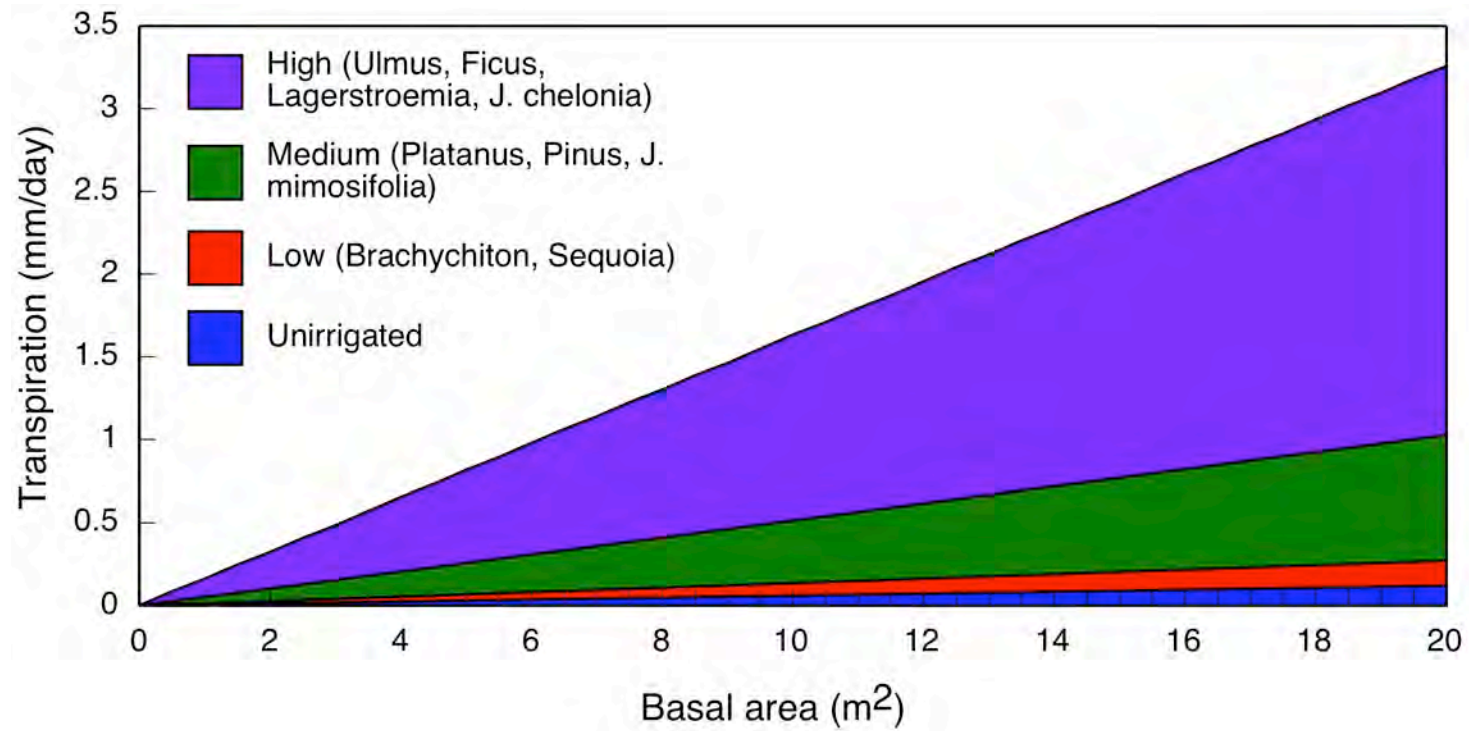
Urban “greening” and tree planting programs are gaining popularity, but they will require water



THE
GREEN BELT MOVEMENT



Water use is highly sensitive to the choice of plant species



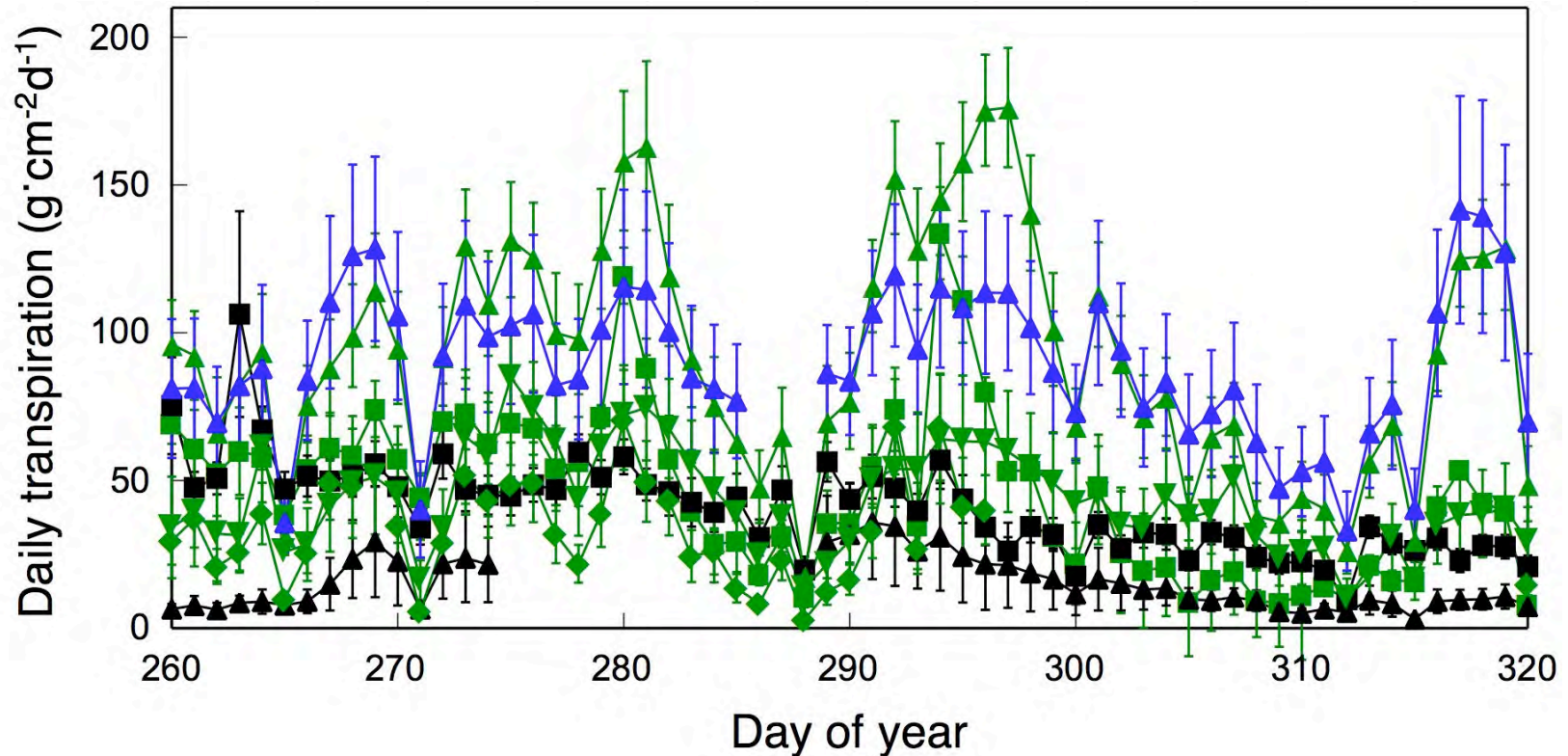
Choosing native species will not necessarily reduce water use

Native species:

Platanus racemosa
Malosma laurina

Mediterranean:
Pinus canariensis

Tropical:
Jacaranda chelonina



Why? We need to consider plant ecology

Native *Platanus racemosa*
California sycamore

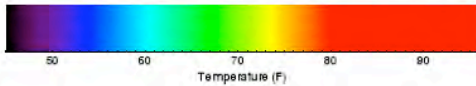
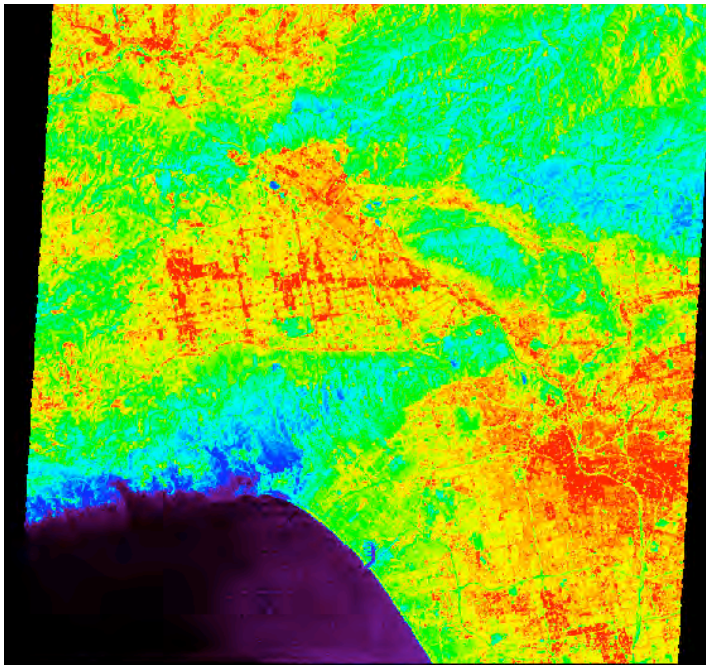


Non-native *Pinus canariensis*
Canary Island Pine



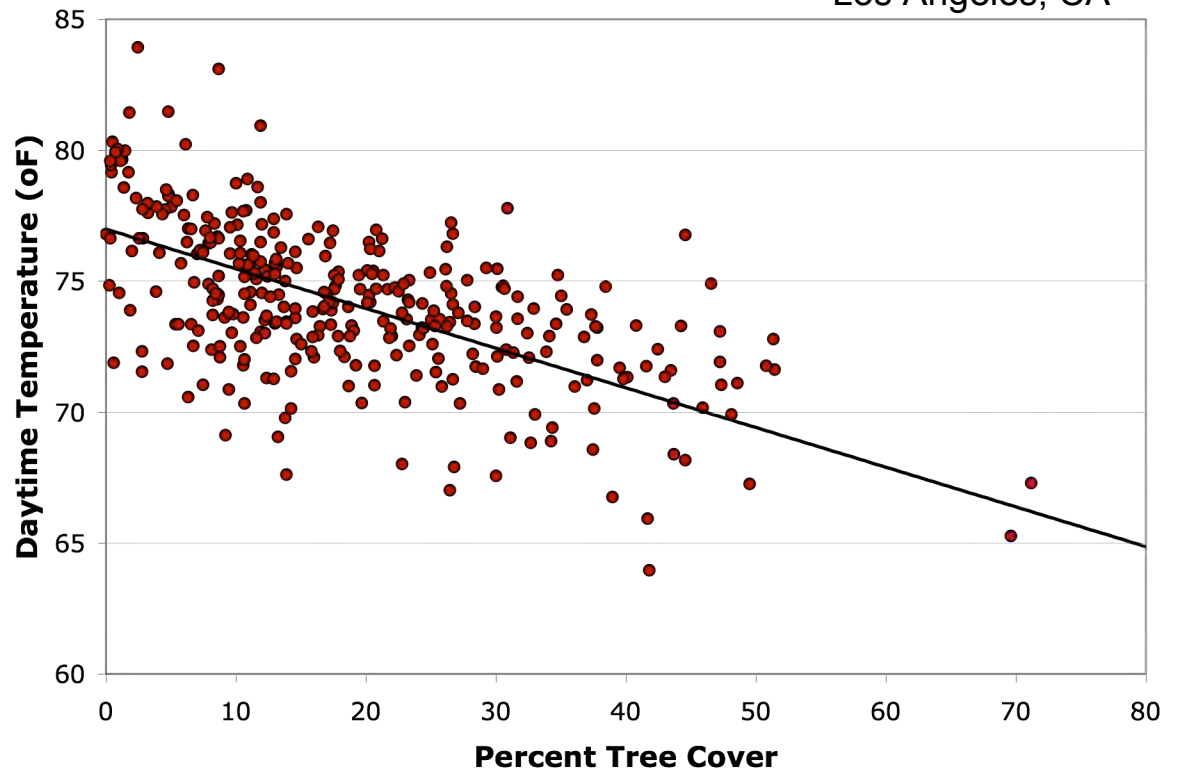
There is a tradeoff between water conservation and climate: *Irrigation makes cities cooler*

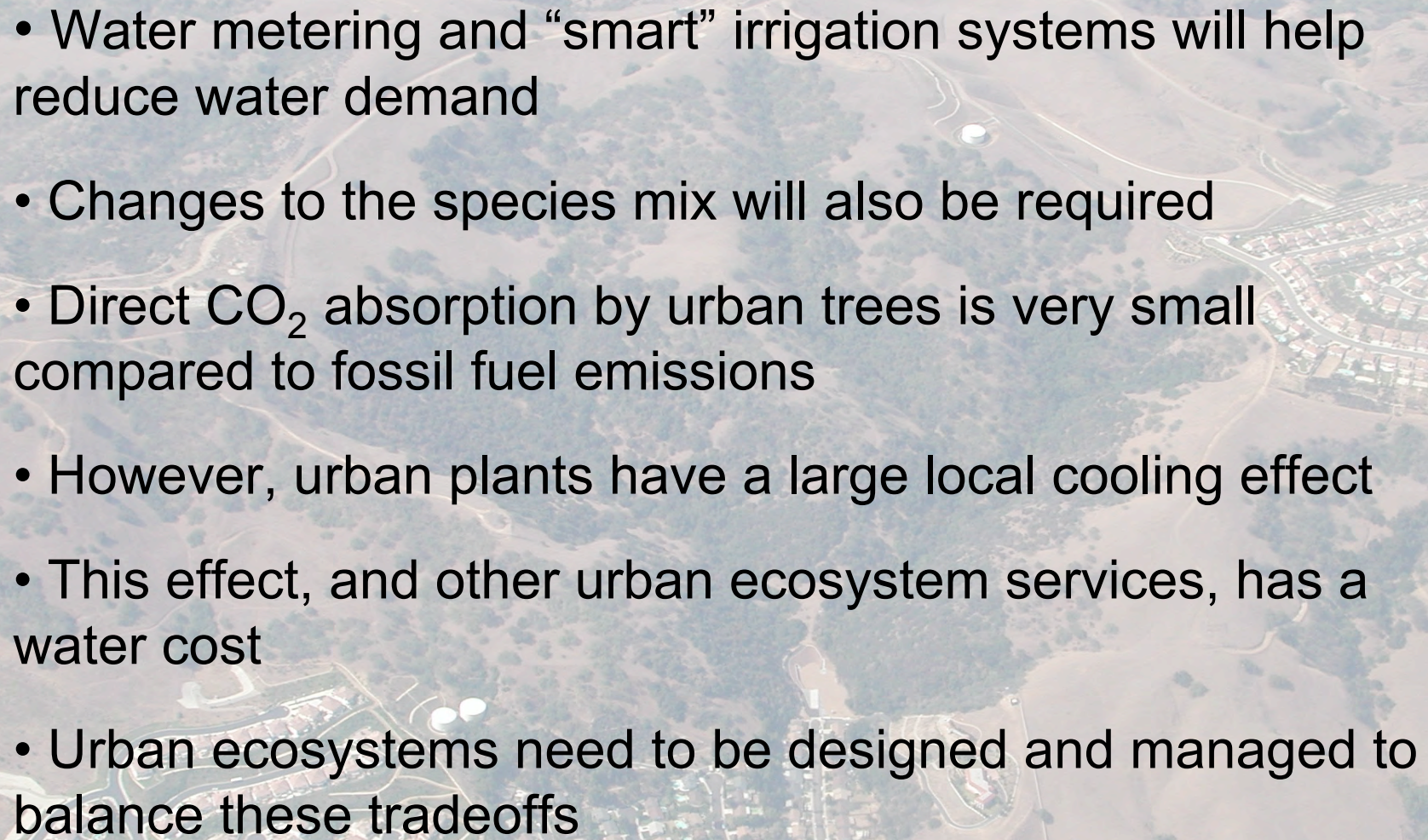
ASTER surface kinetic temperature



Source: Sassan Saatchi, NASA JPL

Los Angeles, CA



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- Water metering and “smart” irrigation systems will help reduce water demand
 - Changes to the species mix will also be required
 - Direct CO₂ absorption by urban trees is very small compared to fossil fuel emissions
 - However, urban plants have a large local cooling effect
 - This effect, and other urban ecosystem services, has a water cost
 - Urban ecosystems need to be designed and managed to balance these tradeoffs



An aerial photograph of a suburban neighborhood with a large reservoir in the background. The text is overlaid on the image.

Outdoor urban water consumption will be need to reduced

An ecological approach that considers ecosystem services by species can maximize environmental benefits of outdoor water use

